Rubber Journal and International Plastics

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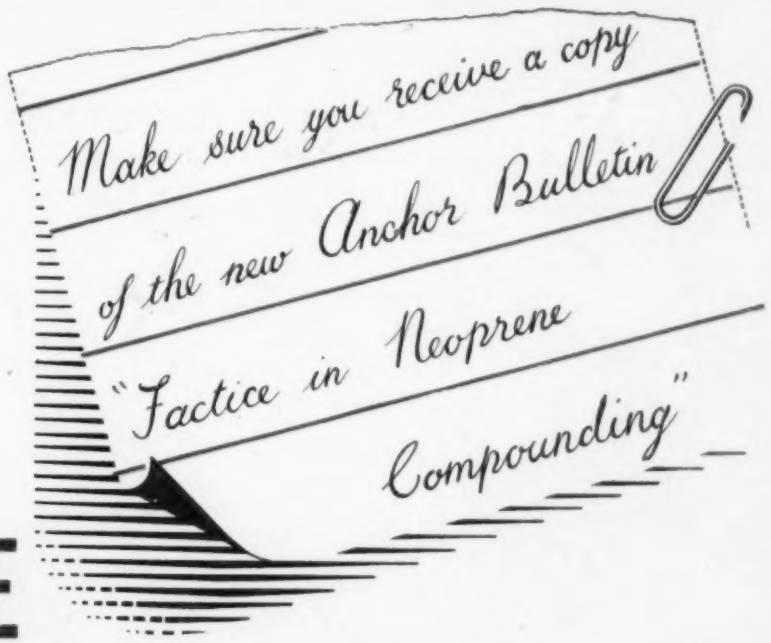

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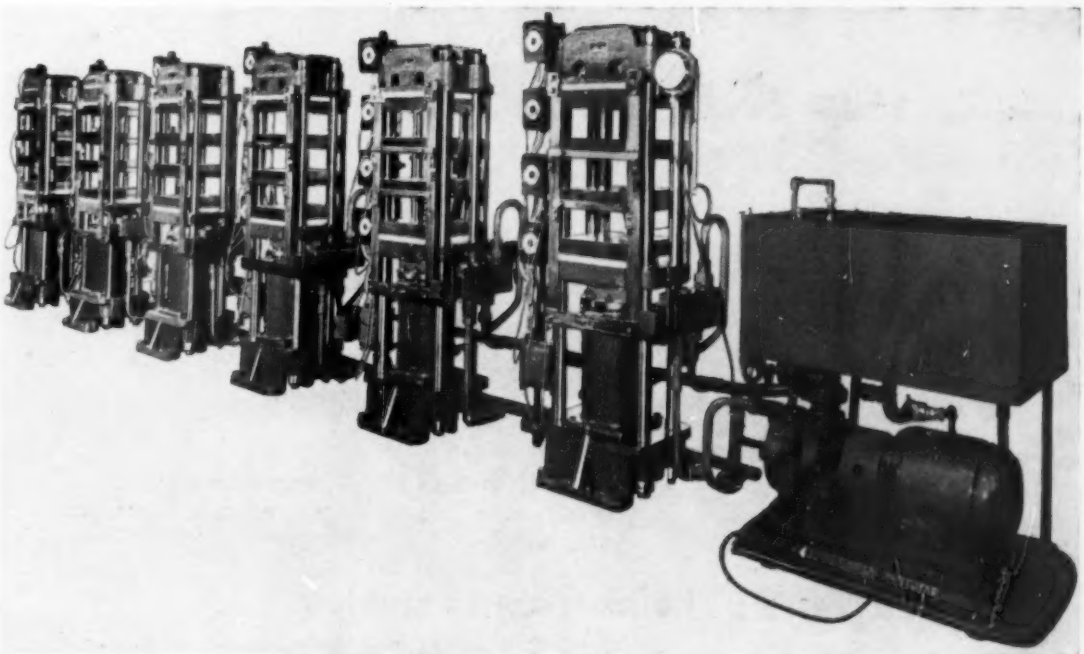

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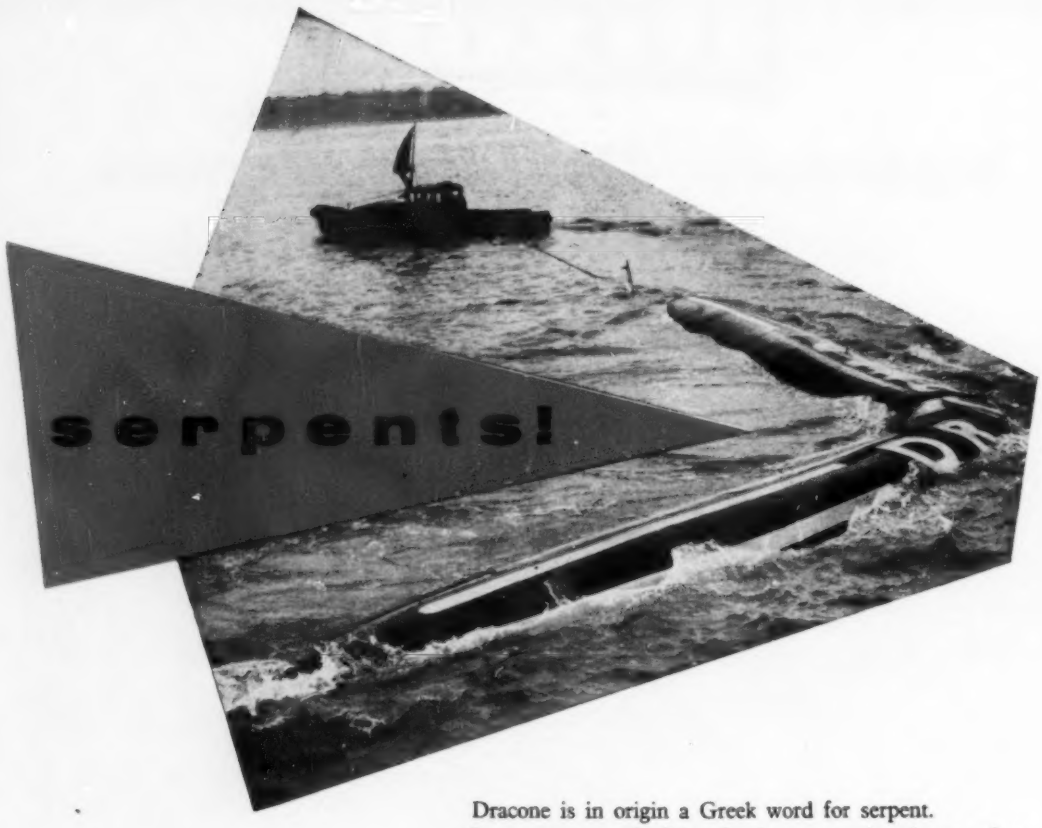

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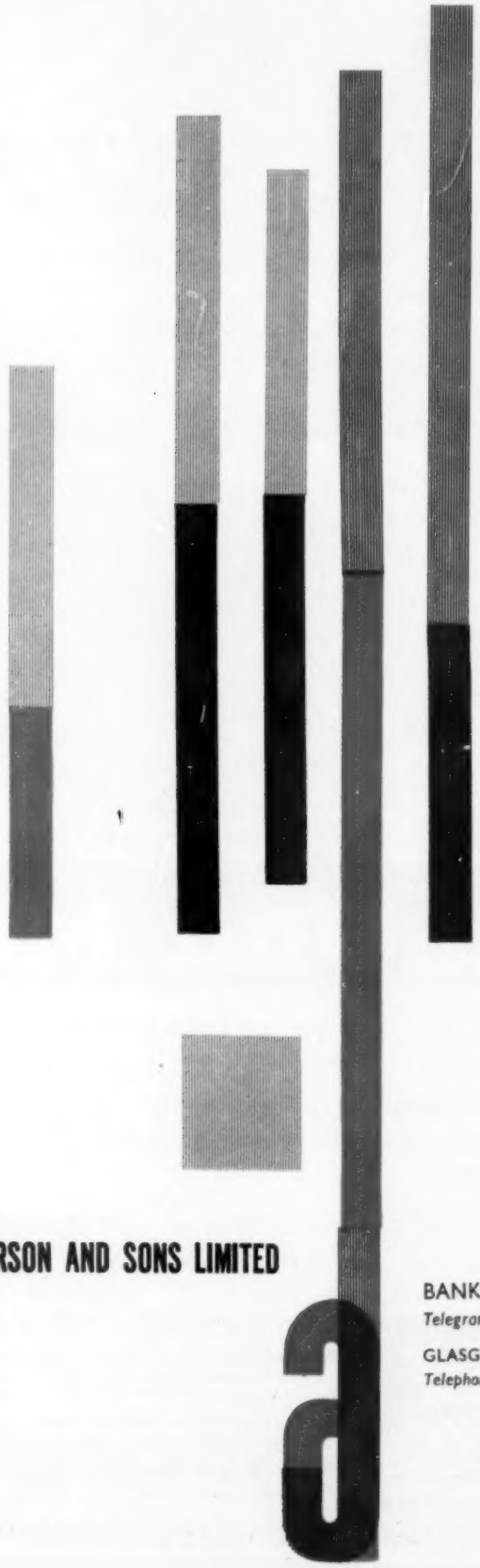

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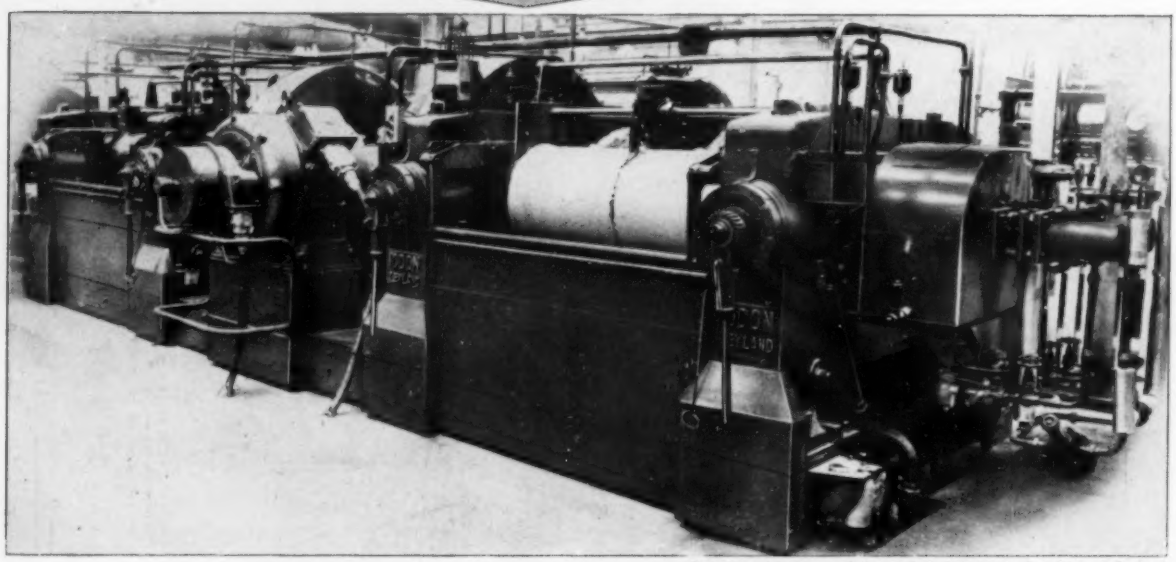

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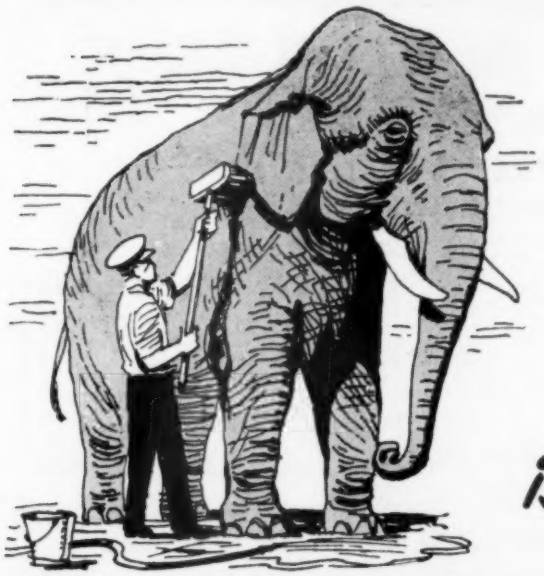

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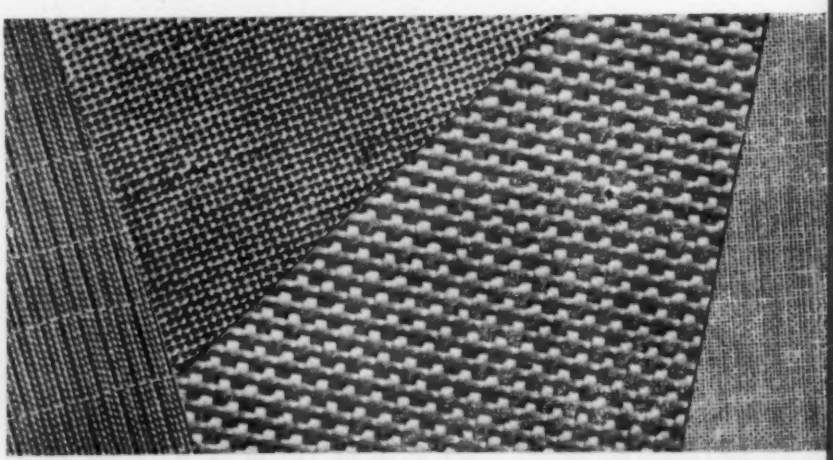

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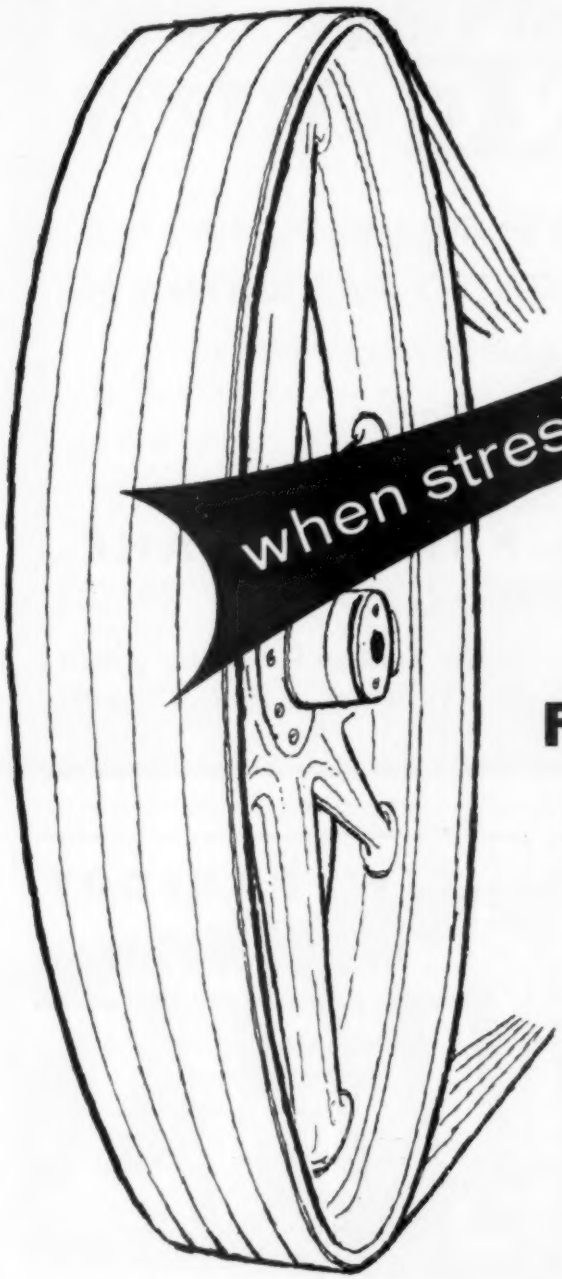

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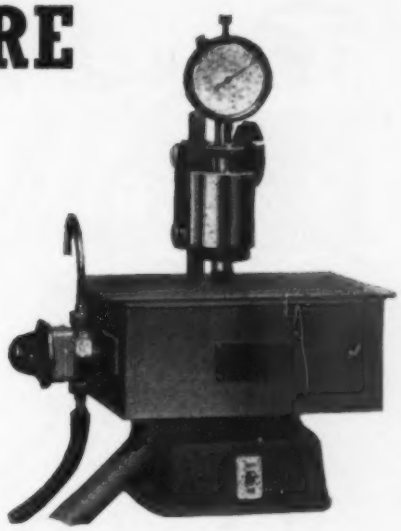

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Rubber Journal and International Plastics

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IN ITS 76th YEAR

January 16 1960

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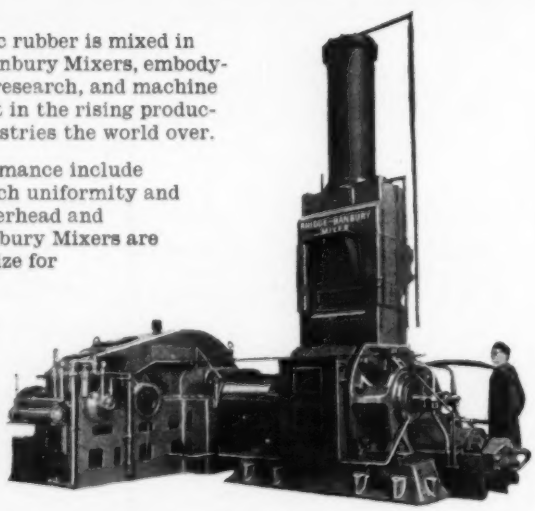

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NOTES of the WEEK

Automation and Plastics

THE 'automation revolution', although still in its infancy, has already behind it solid achievement throughout the world. Like other revolutions in the world of industry, it was upon us before we realized it; in fact, for a number of years before the name was coined. Some interesting examples of the results already achieved by the introduction of automation into various industries were contained in an article in the *Financial Times* of January 8. Among those quoted was the experience of a company manufacturing building board who were able to reduce their labour force from about 40 men to two men per shift and turn out a better product. There were the instances of the UK car manufacturing company who estimate savings in the foundry due to automation at £1m. a year with increased production; the USA car manufacturers who increased output per man tenfold; the USA electronic equipment makers who reported that production was trebled with greatly reduced operating labour; and the USSR ploughshare factory which cut its labour force by three-quarters and halved the cost of manufacture (excluding cost of metal). In outlining the use of automation techniques in British car manufacture—which will in a few years bring about savings in the cost of production of the order of 25 to 40%—the writer makes interesting mention of plastics. After referring to experiments with new methods of painting cars, methods well suited to automation, mention is made of the press shop where the body panels of cars are moulded. 'It (the panel moulding process) could be made subject to automation in the same way as other processes, but there is a general expectation here that another major revolution in the use of materials will take place—namely, the substitution of plastics for metals. This substitution will greatly simplify and eliminate many of the problems of introducing automation in this particular field of car manufacture. The plastics used are likely to be found among the new nylons, polypropylenes and polyformaldehydes. This, however, is a revolution that will inevitably take place in the more distant future'. Just how distant that future will be does not, of course, depend entirely upon automation techniques nor the development of materials.

And Working Hours

INHERENT in the true conception of automation, as the *Financial Times* article points out, is the 'robot angle', the self-correcting element which not only carries out its operations automatically but which adapts the instructions given to it in accordance with the conditions it finds occurring while it is operating. This angle is linked, or potentially linked with present demands for a 40-hour week. Soon enough the demand may be—at some time in the future must be—for a 35-hour week. Ignoring another and fascinating problem, that of the use of leisure which one of these days will really face us, or our children, there is still the question of employment. As far as the new generations of technicians, technologists and scientists, coming in rapidly increasing numbers, one hopes, from the universities and technical colleges, are concerned, employment should not prove a problem. Many of them will be engaged in setting, supervising, maintaining and developing automated processes. Processes which, according to Russian and other experts, increase productivity on an average up to tenfold. In brief, automation, in those industries which best lend themselves to it, means higher productivity with fewer but more-skilled workers. This could add up to more production shifts and shorter shifts, a trend beginning to appear. This in turn must affect the non-technically qualified and the question arises as to whether sufficient numbers are going to move from these ranks to those of the technically qualified in time to make the two lines of development (automation and the demand for shorter working hours) converge neatly or clash. It is to be hoped that at long last this particular chicken and egg will arrive simultaneously.

Misdirected

BY the very nature of its functions, the Post Office deals in enormous numbers of things. Millions of phone calls, millions of telegrams and billions of stamps. Some of these figures have ceased to stun, probably because of growing acquaintance with the numbers of such things as, on the small side, cells in the human body and, on the larger side, the distances between heavenly bodies. Even so, facts issued by the Post Office can still amaze. An example is the recent statement that one-third of the 28,000,000 letters and packets sorted every day are incorrectly addressed according to the standards laid down. More than 5,000,000 a day have serious errors or omissions. Just what the Post Office calls 'serious' is not exactly clarified by the further statement that on over 1,500,000 letters and packets the post town is omitted. These are really astonishing figures and a sad reflection on the efficiency of individuals and company postal departments alike. Ours, of course, is highly efficient, but we are going to check.

NEWS *Briefs*

US PLASTICS OUTPUT—UK TYRE PRICES RISE SYNTHETIC RUBBER IN HOLLAND AND JAPAN AUSTRALIAN CARBON BLACK—MORE US NYLON

●**United Kingdom**—The India Tyre Company announced on January 8 an increase of 2½% on the price of all India tyres and tubes as from last Monday. The company said the increase was due to higher costs of raw materials and rising production costs generally. Pirelli has also announced that the price of all its covers, tubes, flaps and remould tyres has been raised by 2½%.

●**Switzerland** — A group of Swiss banks, headed by the Swiss Bank Corporation, has underwritten a 12 million Swiss franc 4¼% debenture issue by the Société International Pirelli SA, Basle, the holding company of the foreign subsidiaries of Italy's Pirelli group. The loan was offered for public subscription in Switzerland from January 8 to 14, at a price of 99% including stamp duty. The debentures are to be quoted on the Basle and Zurich stock exchanges. Maximum redemption period is 15 years and the company reserve the right to repay the loan after ten years.

●**Japan**—A second Japanese company has started production of synthetic rubber—the Japan Synthetic Rubber Producing Company, whose plant is at Yokkichi, central Japan. It is stated to have an initial production capacity of about 30,000 tons annually. Within the next five years capacity is expected to increase to 45,000 tons annually. From April 1960 the plant will also begin manufacturing butadiene at a rate of 33,500 tons annually.

●**United States** — Allied Chemical Corporation will triple its annual production capacity for nylon-6 yarn for automobile tyres, Mr Kerby H. Fisk, chairman of Allied Chemicals, has announced. Allied's current nylon-6 capacity is estimated at 25m. lb. a year which would mean the expansion plans call for around 75m. lb. annual capacity.

●**Holland** — The synthetic rubber plant being built for Shell Chemische Fabrieken NV (Royal Dutch/Shell group) at Pernis, near Rotterdam, will start operating in the near future. The plant, the first synthetic rubber factory of the Royal Dutch/Shell group on the European Continent, will comprise a unit for the production of butadiene, a styrene unit and a copolymerization unit. Annual capacity will be 50,000 tons of rubber. The new plant will supply the markets in Belgium, the Netherlands and Luxembourg and considerable quantities will be available for export to other countries in and outside Europe.

●**Australia** — Completion of Australia's first carbon black production facilities has been announced by the United Carbon Company. The new plant will have initial capacity of 30 million lb. and will be able to supply all of Australia's current oil furnace black requirements. Previously, Australia imported approximately 16,000 tons of carbon black per year, mostly from the UK.

●**Indonesia**—Indonesia will be able to provide 80% of the rubber tyres it needs by 1960, Mr Zakaraia Raid, head of the Industrialization Bureau of the Basic Industries Department, said in Djakarta.

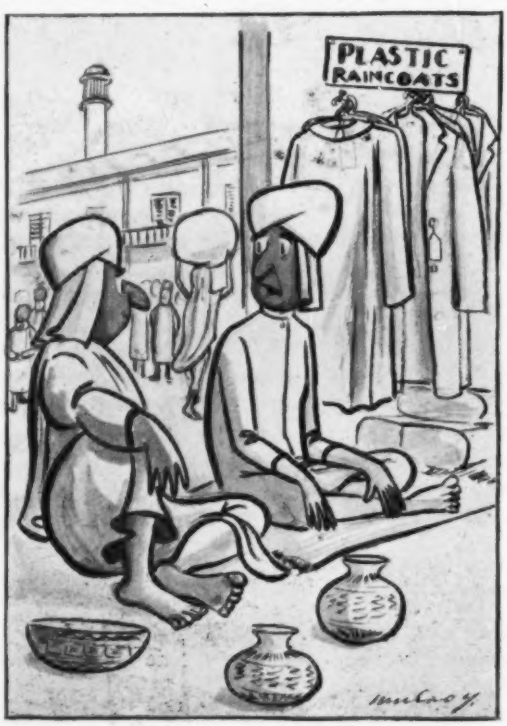
●**United Kingdom** — Work on a £2,500,000 extension to the India Tyre and Rubber Company's factory at Inchinnan, Renfrewshire, started recently. The extension will add 20,000 sq. ft. of floor space. It is part of a general modernization plan to meet the increased demand for the products not only of the India Tyre and Rubber Company but also of Dunlop Rubber Company (Scotland) Ltd. It is hoped to have the new plant in operation by September.

●**Holland** — Prices for Dutch-made automobile tyres were increased on January 11 by 3%. The advance is attributed to the rising trend in world rubber market prices.

●**United States**—Plastic products last year climbed by 25% in output and 20% in value over 1958, the Society of the Plastics Industry, Incorporated, reports. Production amounted to 5,600,000,000lb. of raw materials worth some $3,000m., up from 4,518,000,000lb. valued at $2,500m. in 1958, the report said. On top of the large increase last year, the industry indicated plans of a 25% expansion in 1960, SPI said, but anticipates output at 15% over 1959 as it would take time to bring the additional plant into operation.

●**Canada** — Reichhold Chemicals (Canada) has acquired Varcum Chemical (Canada), manufacturer of phenolic moulding compounds with a plant at Lindsay, Ontario. Varcum was acquired from Reichhold Chemicals of White Plains, New York, which holds the major stock interest in Canadian Reichhold.

●**United States** — The Goodyear Tire and Rubber Company has declared a quarterly dividend of 22½ cents on the new common share, payable on March 15. This is equivalent to the 67½ cents paid on the old stock in December prior to the three-for-one stock split. A 2% stock dividend also was paid concurrent with the split-up.



'It's all right for you, but my trade's rather seasonal if you see what I mean!'—467

POLYSAR KRYNACS

The non-staining properties of Polysar* Krynac (nitrile) rubbers have been markedly improved and the raw polymer colour has been lightened. These improvements, together with the inherent advantages of easy processing and relatively low water absorption, provide the best balance of properties in oil resistant rubbers.

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Many applications requiring varying degrees of oil resistance have been launched by the adoption of one of the Polysar Krynac types. In the past these have usually been black compounds. More recently compounders have turned to Polysar Krynac as the base polymer for coloured compounds —notably in the development of oil and heat resistant industrial shoe soling and smooth, flame-resistant cable jackets. In both black and coloured compounds Polysar Krynac has improved the product quality and reduced production costs.

Information detailing light coloured and black compound applications is available in over 40 Polysar Technical Reports.

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Rubber and Plastics in South Africa

NEWS OF FIRMS AND PRODUCTS

A WINDSCREEN protector designed for motorists travelling on untarred roads and unsurfaced deviations—where windscreens are often shattered by flying stones—is being produced in the Federation of Rhodesia and Nyasaland, according to the Automobile Association there. The windscreen protector consists of a sheet of clear Perspex cut and curved to the contour of the individual car windscreens and held in position ¼in. from the glass by several rubber suckers. The suppliers, who claim that the work of the windscreen is not interfered with, offer after-sales service in the form of free polishing and the removal of scratches from the Perspex.

Pretoria Industrial Plastics

About two years ago Pretoria Industrial Plastics (Pty.) Ltd., Pretoria West, acquired an eight-acre site in the industrial area, and the factory now in use there covers an area of 62,000 sq. ft., and will be added to as the demand for plastics increases. As it is there is a very strong South African demand for the increasing range of products made in this factory, which has about 300 workers, and is being operated on a 24-hour basis. The factory is modern in every respect, and as it is using the best available materials, it claims that its products are comparable with those made anywhere in the world. New plastic materials are regularly being acquired and these are submitted to a long course of testing before they are adopted for regular production purposes. Europe and the United States are supplying the bulk of the raw materials at present used in this factory, where the materials in greatest use comprise granular polythene, the acrylics, acrylonitriles, PVC, styrene, acetate, the phenolics and ureas and nylon. The biggest of some 60 separate machines installed in this factory is the 45oz. injection moulding press which is the largest in South Africa, and it is in constant use moulding in one operation toilet seats and flaps. The moulds for this and other work in the factory are being made in the company's own die-shop, which produces all these requirements apart from a few special types that have to be imported and a few simple ones it is cheaper to obtain locally.

Although most of the work in this injection moulding machine is automatic, the company insists on regular batch tests to ensure that all the goods shipped out are up to specification. Because moulding is a relatively expensive form of plastics production, it is necessary to have long runs to make it profitable, and thus only articles are made for which a big market, both in South Africa and the adjoining territories, can be developed. As a result the less costly extrusion process is still followed in the manufacture of lay-flat film, pipes, sheeting, and bristles. By the extrusion process the company is making high-quality PVC piping; piping strong enough to withstand crushing by the weight of a loaded five-ton truck. The manufacture of this and other extrusion lines is also largely by automatic processes, but all the manufactured lines are constantly examined to ensure that they are up to standard.

Glass Fibre for Antarctic

The Department of Transport, which maintains South Africa's island weather stations in the Antarctic, is using fibreglass to make oil storage tanks because of the sea-air corrosion problem. The first of these completely rust-proof tanks has been made in a fibreglass factory at Maitland, Cape Town. It has a capacity of 500 gallons and it is to go to Marion Island to hold diesel fuel for the generating plant at the weather station there. Similar tanks are to be built for Bouvet Island, and probably for other weather outposts.

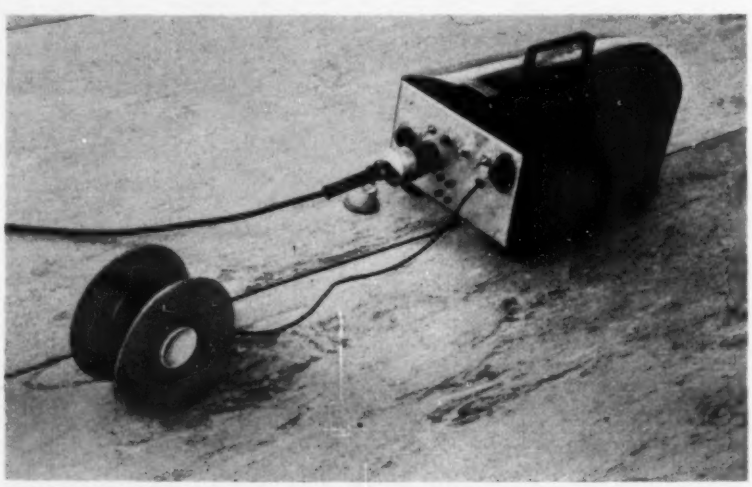
Litzler Unit

The General Tire and Rubber Co. (SA) Ltd., state that as a consequence of equipping their Port Elizabeth factory with a Litzler dip and hot stretch unit they are able to make a stronger and safer tyre. Each of the machines in this up-to-date unit are rated at 1,050 hp, with electronic control at every stage. They mix the carbon black and other chemicals into raw rubber to yield the finely dispersed, high modulus mixture.

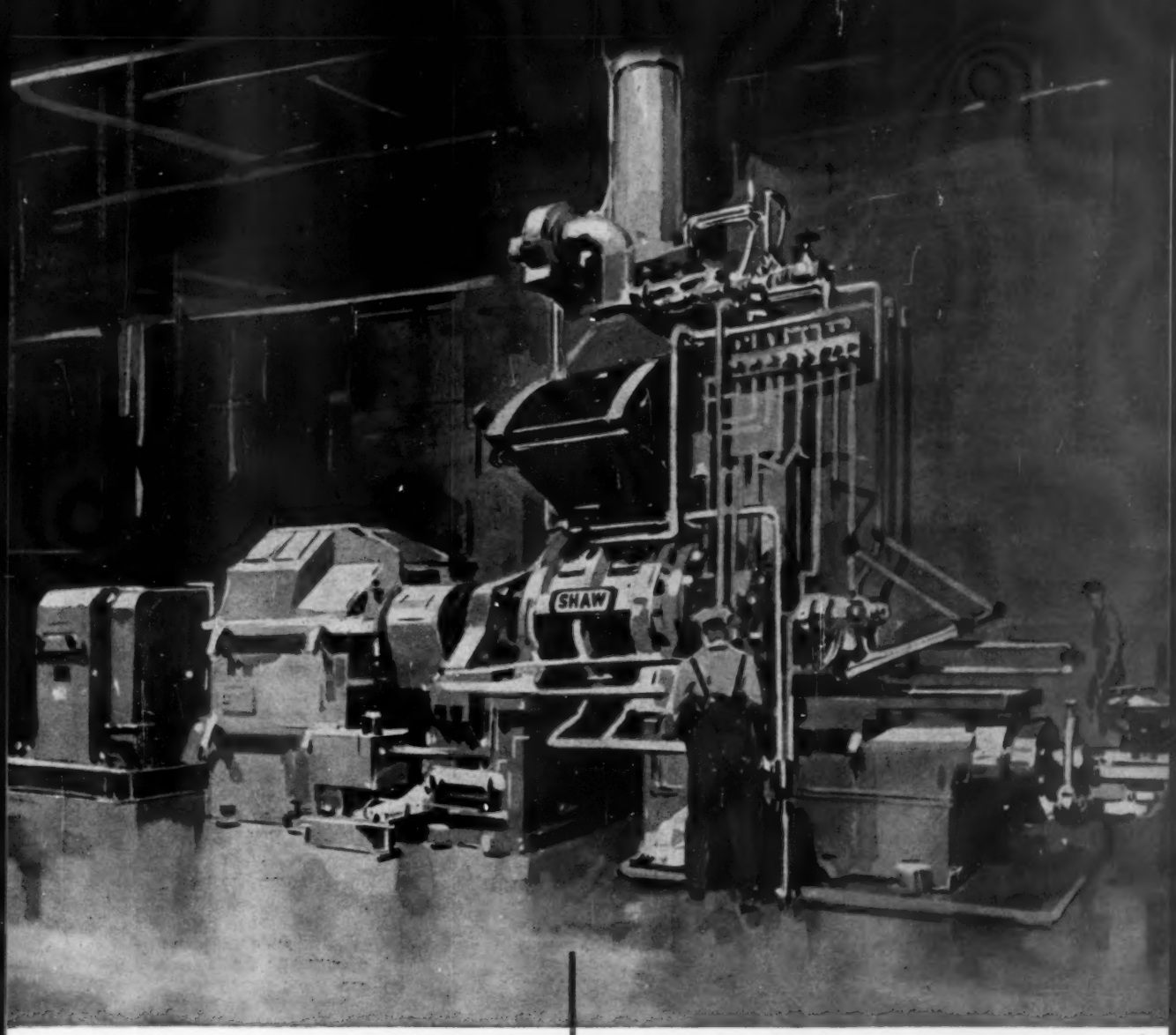
West German Industry

The West German rubber manufacturing industry increased its output in 1959 by about 10 to 12% on average compared with 1958, according to industry sources in Hannover.

Last year was described as an unusually good one for West Germany's rubber manufacturing industry. Some factories achieved an increase in production which considerably surpassed the industry's average. The number of people employed in the industry arose by only about 8%, which indicated that rationalization measures carried out during the year were proving successful. It was added that the industry's turnover was believed to have increased more than the average rise of about 8% recorded for all West German industries.



This portable electric machine that joins together the edges of plastic flooring has been patented by the Phoenix Rubber Co. Ltd., of Slough, Bucks, makers of Phenco flooring. Nicknamed 'The Mouse' by Mr G. R. B. Clarke, managing director of Phoenix, it generates its own heat as it moves along and seals the edges of the flooring with a heated strip of plastic material from a drum it tows behind itself. It even has its own feelers—if they touch any obstruction, the machine automatically stops



SHAW INTERMIX for good compounding

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The consequent diversity in formulations calls for versatility of plant. The Shaw Intermix is the most versatile internal mixer for rubber, plastics, and allied materials because it has the following advantages:—

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OVERSEAS AGENTS THROUGHOUT THE WORLD

P.2806

Low Temperature Vulcanization

THE ROLE OF FREE RADICALS*

IN spite of a large number of investigations, the mechanism of the vulcanization process has not so far been finally elucidated. In particular, no agreement has been reached as to the character of the reactions which take place in the process of vulcanization; some investigators consider that the process of vulcanization is determined mainly by reactions of ionic character, while others suggest that they are radical reactions. We therefore carried out some work with a view to obtaining data on the nature of the reactions in sulphur vulcanization of rubber.

To facilitate the study of the mechanism we worked under mild conditions of vulcanization. The vulcanization systems used were: di-2-benzthiazyl disulphide (MBTS) / hydrogen sulphide, benzoyl peroxide/ hydrogen sulphide, sulphur dioxide/ hydrogen sulphide, systems which are sources of nascent sulphur at room temperature.

As we have already shown[1], dibenthiazyl disulphide interacts with hydrogen sulphide at 20°C. in benzene or toluene, according to the equation:

$$RSSR + H_2S \rightarrow 2RSH + S \quad (1)$$

with a quantitative yield of mercaptobenzthiazole and elementary sulphur (Fig. 1). No other reaction products were observed. Under the same

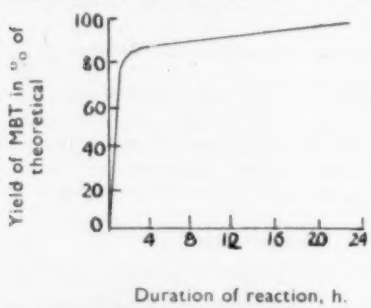


Fig. 1. Kinetics of formation of mercaptobenzthiazol by the interaction of dibenzthiazyl disulphide with hydrogen sulphide in toluene

conditions benzoyl peroxide and hydrogen sulphide react to give benzoic acid and elementary sulphur:

$$(RO_2)_2 + H_2S \rightarrow 2ROOH + S \quad (2)$$

The rate of reaction is considerably lower than in the former case (Fig. 2), although the energy of the —S—S— bond is considerably higher than the energy of the —O—O— bond.

In the interaction of sulphur dioxide with hydrogen sulphide in analogous conditions, elementary sulphur is liberated in accordance with the well-known equation:

$$SO_2 + 2H_2S \rightarrow 2H_2O + 3S \quad (3)$$

Since many investigators consider

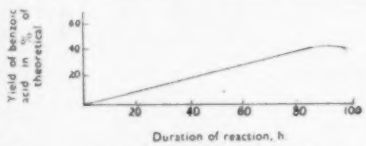


Fig. 2. Kinetics of formation of benzoic acid in the interaction of benzoyl peroxide with hydrogen sulphide in benzene at 20 C.

that sulphur in the nascent state is capable of vulcanizing rubber, we expected to see from these systems a vulcanizing (or structurizing) action upon the rubber.

We assessed the vulcanizing action of these systems from their ability to gel 5% toluene solutions of the sol fraction of purified commercial sodium-butadiene rubber. To freshly-prepared solutions we introduced a definite amount of chemically pure dibenzthiazyl disulphide (or benzoyl peroxide) after which the solutions were saturated with hydrogen sulphide and kept at room temperature. In the case of the sulphur dioxide/hydrogen sulphide system the solutions were previously heated for 30min. at 85° to 90°C. and after cooling were saturated alternately with sulphur dioxide and hydrogen sulphide. Nevertheless, in spite of the liberation of nascent sulphur in all these cases, vulcanization did not take place.

For the disulphide/hydrogen sulphide system we measured the alteration in relative viscosity of solutions of the rubber (Fig. 3), we recorded infra-red spectra and determined the content of combined sulphur both in rubber precipitated from methanol solutions and in the portion of the rubber remaining unprecipitated, obtained by evaporation of the mother liquor. The combined sulphur was determined after boiling the speci-

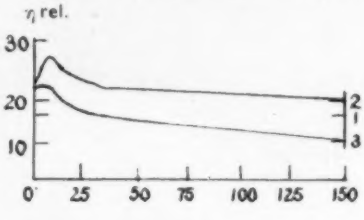


Fig. 3. Change in the relative viscosity of solutions of rubber by the dibenzthiazyl disulphide sulphur dioxide system. 1. Original rubber solution. 2. 2% MBTS H S. 3. 4% MBTS H S

mens with a 10% solution of sodium sulphite (to remove mercaptobenzthiazole).

As may be seen from the analytical data, as a result of the consecutive action of the disulphide and the hydrogen sulphide the combination of the sulphur with the rubber was non-uniform: the precipitated fraction (90% by weight) contains practically no combined sulphur (0.04 to 0.10%), whilst the portion of rubber not precipitated by methanol contains 1.2 to 1.6% of combined sulphur. The infra-red spectrum of the precipitated portion is analogous to the infra-red spectrum of the original rubber, whilst in the unprecipitated portion the content of 1:4 double bonds decreases by 3%, and the content of 1:2 double bonds does not alter* It follows that nascent sulphur does not bring about vulcanization of rubber solutions. However, we present below evidence that these systems may under certain conditions bring about vulcanization of rubber at room temperature.

1—original rubber solution
2—2% MBTS $+H_2S$
3—4% MBTS $+H_2S$

Dibenzthiazyl Disulphide/Hydrogen Sulphide System

In this case vulcanization takes place if the solutions of rubber con-

*By B. A. Dogadkin and E. N. Belyaeva (Vysokomol. Soed., 1959, 1, No. 2, 315-323). Adapted from Translation No. 779/3 prepared by the Research Association of British Rubber Manufacturers.

Translators Note: The authors, sometimes inconsistently, use the terminations '—tiazil' or '—tiozil' (either of which they translate as 'thiazolyl') and '—tiazol'; in the following article these have been rendered as 'thiazyl.'

*In our earlier publication[1] we gave incorrect figures for a considerably greater loss of double bonds.

taining the disulphide are irradiated with diffuse sun or ultraviolet light prior to saturation with hydrogen sulphide. We then have a rate of cure depending upon the duration of irradiation (Figs. 4, 5 and 6).

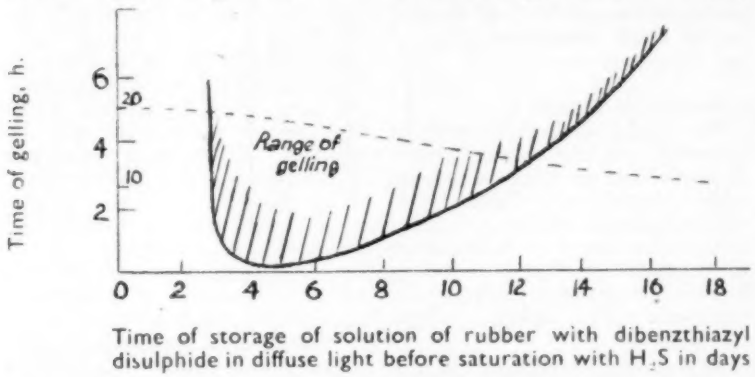

Time of gelling, h.
6
4
2
20
10
Range of gelling
0 2 4 6 8 10 12 14 16 18
Time of storage of solution of rubber with dibenzthiazyl disulphide in diffuse light before saturation with H_2S in days

Fig. 4. Relation between time of gelling of rubber solutions by hydrogen sulphide and time of prior standing with dibenzthiazyl disulphide (4%) in diffuse light

As we may see from these figures, prior to a certain time of irradiation, and also after prolonged irradiation, no gelling is observed.

The presence of a gelling range is apparently linked with the existence in the solution of radicals of rubber, formed as a result of the action of short-lived sulphenyl radicals formed in the photochemical dissociation of the disulphide. There is connection between the character of the change in the relative viscosity of solutions

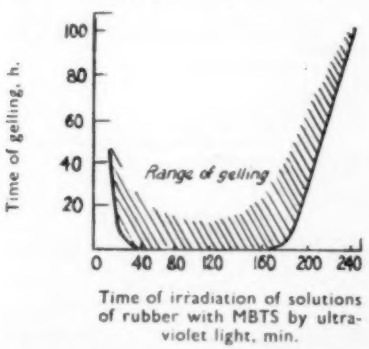


Fig. 5. Relation between the time of gelling of rubber solutions by hydrogen sulphide and the time of prior irradiation with dibenzthiazyl disulphide (4%) by ultra-violet light

of unvulcanized rubber when standing with disulphide in light and their capacity for gelling under the action of hydrogen sulphide (Fig. 7). Corresponding to the period of the greatest change in the viscosity of the solutions we find a range of gelling. In an irradiated solution of rubber, containing MBTS, a qualitative reaction (formation of lead mercaptide) may be used to confirm the presence of mercaptobenzthiazole.

The rate and degree of polymerization are influenced by the composition of the gaseous phase over the solution; in an atmosphere of nitrogen gelling occurs later, but is maintained for longer, than in air (Fig. 6). The process of vulcanization is inhibited by a number of substances, such as hydroquinone, phenyl-beta-naphthylamine, triethanolamine or diphenyl guanidine.

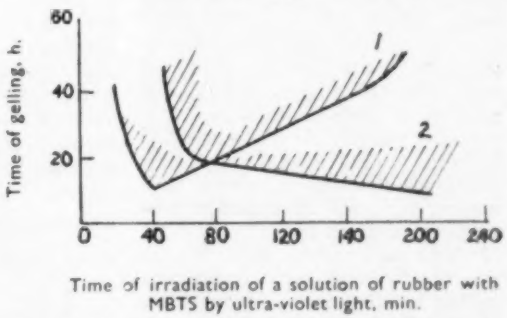


Fig. 6.—Relation between the time of gelling of rubber solutions by hydrogen sulphide and the time of prior irradiation with dibenzthiazyl disulphide (4%) by ultra-violet light. 1. In air. 2. In nitrogen

Benzoyl Peroxide/Hydrogen Sulphide System

This system vulcanizes rubber in the presence of an amine (phenyl-beta-naphthylamine), but with a large excess of phenyl-beta-naphthylamine (with a molar ratio of amine to peroxide in excess of 20:1), there is no cure. This runs counter to the results of Dolgoplosk *et al*[2], who observed gelling of solutions of rubber under the influence of benzoyl peroxide and hydrogen sulphide and explained it by the occurrence of a radical reaction between the peroxide and hydrogen sulphide:

$$ROOR + H_2S \rightarrow ROH + HS' + RO' \quad (4)$$

In fact, as follows from the data given above, gelling was observed in their experiments, evidently owing to the presence of traces of phenyl-beta-naphthylamine in the rubber, and not as a result of a reaction[4]. It is possible that the reaction of benzoyl peroxide with hydrogen sulphide takes place according to the type of redox reaction described by Razuvaev[3], and becomes a radical reaction only in the presence of an amine.

There are in the literature references to the radical character of the reaction of benzoyl peroxide with certain amines (Bagdasar'yan[4], Chaltykyan[5], Horner[6], Imoto[7] and others).

In order to obtain additional confirmation of the radical nature of the reaction of the peroxide with an amine a special investigation of the reaction of benzoyl peroxide with phenyl-beta-naphthylamine was made. As a result of the tests carried out it was found that benzoyl peroxide reacts vigorously at room temperature in ether solution with phenyl-beta-naphthylamine to form benzoic acid and O-benzoyl - N - phenyl - N - beta-naphthyl hydroxyl amine. The yield

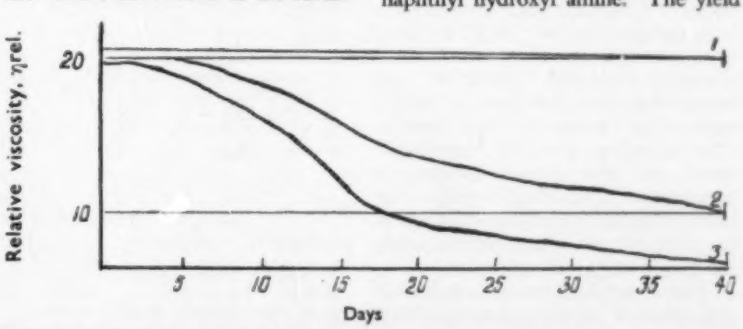


Fig. 7. Change in the relative viscosity of rubber solutions on standing with dibenzthiazyl disulphide in diffuse light. 1. Original solution. 2. With 2% MBTS. 3. With 4% MBTS at 20°C.

of benzoic acid depends upon the ratio of the reacting substances. With an equimolecular ratio the amount of benzoic acid corresponds to the stoichiometry of a bimolecular reaction. With a 2:1 ratio the reaction leads to the liberation of benzoic acid in amounts greater than corresponding to the equation of a bimolecular reaction. The reaction product, O-benzoyl-N-phenyl-N-beta naphthyl hydroxyl amine brings about decomposition of the benzoyl peroxide, with the formation of benzoic acid.

On the basis of these results we may put forward the following scheme of interaction of peroxide and amine:

1. $ROOR + R'R''NH \rightarrow [ROOR \cdot R'R''NH] \rightarrow ROH + RO\cdot + R'R''N\cdot$ — Chain initiation
2. $RO\cdot + R'R''NH \rightarrow ROH + R'R''N\cdot$
3. $R'R''N\cdot + ROOR \rightarrow R'R''NOR + RO\cdot$
4. $ROOR + RONR'R'' \rightarrow [ROOR \cdot RONR'R''] \rightarrow 3RO\cdot + \cdot NR'R''$ — Chain propagation
5. $RO\cdot + R'R''N\cdot \rightarrow RONR'R''$
6. $RO\cdot + RO\cdot \rightarrow ROOR$ — Chain termination
7. $R'R''N\cdot + R'R''N\cdot \rightarrow R'R''NNR'R''$

where $R = C_6H_5CO$, $R' = C_6H_5$ and $R'' = C_{10}H_7$

We also found that O-benzoyl-N-phenyl - N - beta - naphthyl hydroxyl amine initiates the vulcanizing action of the benzoyl peroxide/hydrogen sulphide system more vigorously than does the original amine. The addition of small amounts of o-benzoyl - N - phenyl - N - beta - naphthyl hydroxyl amine caused immediate gelling of solutions of rubber. In a number of cases vulcanization proceeded to such an extent that the gel obtained was in crumb form. We did not observe any such pronounced gelling in the case of phenyl-beta-naphthyl amine.

Sulphur Dioxide/Hydrogen Sulphide System

The vulcanizing action of this system becomes apparent by the use of freshly-prepared, unheated solutions of rubber. Gelling takes place in 1½ to 2 hours after saturation of the solutions with the gases. If the solution is heated, prior to saturation with the gases, at 90° for 30 minutes, then gelling is not observed. Hydroquinone, diphenyl guanidine and phenyl-beta-naphthylamine inhibit the vulcanizing action of this system. The inhibiting action of these additions, and also of prior heating, is apparently connected with the destruction of peroxides, existing in the rubber itself, which are necessary for the initiation of vulcanization.

The amount of bound sulphur in gels obtained by the action of MBTS and hydrogen sulphide or benzoyl peroxide and hydrogen sulphide was 0.6 to 0.7%. The infra-red spectra of the gels showed that in the former case 27% of the 1:4 double bonds and 60% of the 1:2 double bonds disappeared; on vulcanization by the system benzoyl peroxide + amine + hydrogen sulphide 60% of the 1:4 double bonds and 75% of the 1:2 double bonds disappeared (Figs. 8 and 9).

Assessment of Results

The results obtained, namely: the formation of mercaptobenzthiazole observed when the rubber is standing with dibenzthiazyl disulphide in diffuse light; the inhibiting action of additions of amines or hydroquinone in vulcanization by the systems dibenthiazyl disulphide/hydrogen sulphide and sulphur dioxide/hydrogen sulphide; the non-stoichiometric yield of benzoic acid by the interaction of benzoyl peroxide with rubber in the presence of an amine; the disappearance, on gelling, of a greater quantity of double bonds in the rubber, not corresponding to the quantity of combined sulphur; the part played by previous heating in Peachey vulcanization and certain other established kinetic peculiarities; all make it possible to conclude that the low-temperature (vulcanization) investigated cases proceeded according to a radical mechanism and can be described by means of the following schemes:

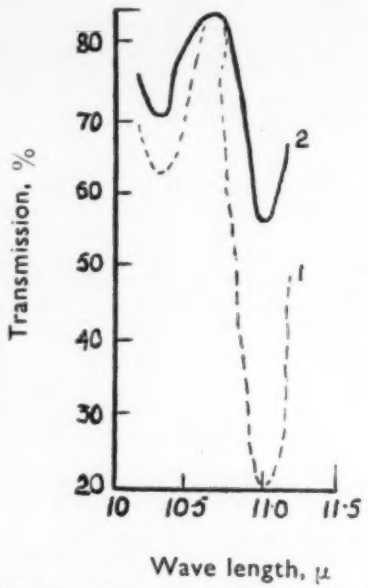


Fig. 8. Infra-red spectrum of gel produced by vulcanization by the system dibenzthiazyl disulphide-hv-hydrogen sulphide in the double bond absorption bands range. 1. Spectrum of original rubber. 2. Spectrum of gel

1. Vulcanization (structurization) of rubber by the system dibenzthiazyl disulphide-hydrogen sulphide

1. $RSSR \rightarrow 2RS\cdot$ — Chain initiation
2. $RS\cdot + Ka \rightarrow Ka\cdot + RSH$
3. $Ka\cdot + H_2S \rightarrow Ka + HS\cdot$
4. $Ka + HS\cdot \rightarrow KaSH\cdot$
5. $Ka\cdot SH + Ka \rightarrow KaSHKa\cdot$
6. $KaSHKa\cdot + Ka \rightarrow KaSHKa — Ka\cdot$ etc.
7. $Ka + Ka\cdot \rightarrow Ka — Ka\cdot$
8. $Ka + Ka — Ka\cdot \rightarrow Ka — Ka — Ka\cdot$ etc.

Chain propagation (stages 5, 6, 7, 8, 9—structurization reactions)

9. $Ka\cdot + Ka\cdot \rightarrow Ka — Ka$ — Chain termination

2. Vulcanization (structurization) of rubber by the system peroxide + amine + hydrogen sulphide

1. $ROOR \xrightarrow{NHR'R'' : RONR'R''}$ RO· and other radicals according to the scheme above (line 6) — Chain initiation
2. $RO\cdot + H_2S \rightarrow ROH + HS\cdot$
3. $RO\cdot + Ka \rightarrow ROH + Ka\cdot$
4. $Ka\cdot + H_2S \rightarrow Ka + HS\cdot$
5. $Ka + HS\cdot \rightarrow KaSH\cdot$
6. $KaSH\cdot + Ka \rightarrow KaSHKa\cdot$
7. $KaSHKa\cdot + Ka \rightarrow KaSHKa — Ka\cdot$ etc.
8. $Ka + Ka\cdot \rightarrow Ka — Ka\cdot$
9. $Ka — Ka\cdot + Ka \rightarrow Ka — Ka — Ka\cdot$ etc.

Chain propagation (stages 6, 7, 8, 9—structurization reactions)

10. $Ka\cdot + Ka\cdot \rightarrow Ka — Ka$ — Chain termination

3. Vulcanization (structurization) of rubber by the system sulphur dioxide/hydrogen sulphide

1. $KaOOH + SO_2 \rightarrow \left\{ \begin{matrix} KaOOH \\ SO_2 \end{matrix} \right\} \rightarrow KaO\cdot + [SO_2H]\cdot$ — Chain initiation
2. $KaO\cdot + H_2S \rightarrow KaOH + SH\cdot$
3. $Ka + HS\cdot \rightarrow KaSH\cdot$
4. $KaHS\cdot + Ka \rightarrow KaHS — Ka\cdot$
5. $KaHS — Ka\cdot + Ka \rightarrow KaHS — Ka — Ka\cdot$ etc.
6. $Ka + Ka\cdot \rightarrow Ka — Ka\cdot$
7. $Ka — Ka\cdot + Ka \rightarrow Ka — Ka — Ka\cdot$ etc.

Chain propagation (stages 5, 6, 7, 8—structurization reactions)

8. $Ka\cdot + Ka\cdot \rightarrow Ka — Ka$ — Chain termination

where Ka stands for the molecule of rubber; ROOR benzoyl peroxide; RSSR dibenzthiazyl disulphide; Ka· the polymer radical of the rubber hydrocarbon (formed as a result of scission of hydrogen from the α-methylene group or from the tertiary atom of carbon); KaSH· the polymer radical formed in the combination of HS· with the double bond of the molecule of rubber; and Ka-Ka· the polymer radical formed in the combination of Ka· with the double bond of the molecule of rubber.

The effect of vulcanization by the action of dibenzthiazyl disulphide with hydrogen sulphide is a result of reactions 5, 6, 7, 8 and 9, in the course of which transverse links are formed between the molecules of rubber. In reaction 9 the link is formed by the interaction of two polymer radicals which are formed as a result of the scission of hydrogen from the α-methylene group of the

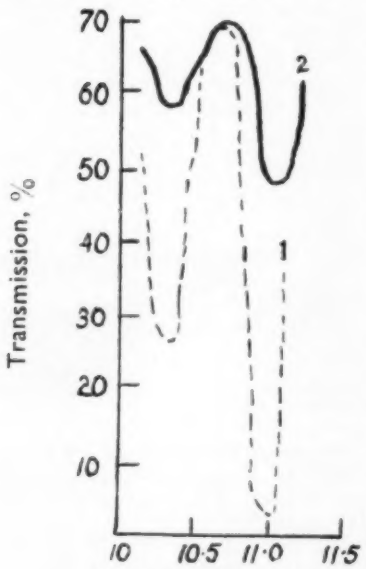


Fig. 9. Infra-red spectrum of gel produced by vulcanization by the system benzoyl peroxide-hydrogen sulphide in the presence of phenyl-beta-naphthylamine, in the double bond absorption bands range. 1. Spectrum of original rubber. 2. Spectrum of gel

molecule of rubber. This reaction represents one of the possible chain termination reactions. In reactions 5 and 6, and in reactions 7 and 8, the transverse links are formed as the result of interaction of the free radicals with double bonds. Since the amount of combined sulphur is considerably less than that of double bonds lost, it is evident that the formation of these radicals leads to the propagation of a polymerization chain comprising several molecules of rubber. The propagation of the polymerization chain is restricted by the steric conditions and by the high viscosity of the system. According to Dogadkin[8], in the case of vulcanization of hard rubber by dibenzthiazyl disulphide at 143° there are not more than 2 to 3 curing reactions to each initiation reaction. The high viscosity of the system may, however, be regarded as favourable to cure since in a viscous medium the polymer radicals have a longer life. Since the effect of structurization is observed after interaction with hydrogen sulphide it is evident that reactions 4, 5 and 6 are the most probable.

It is interesting to note that the product (which does not contain imine hydrogen) of the interaction of benzoyl peroxide with phenyl-beta-naphthylamine, namely O-benzoyl-N-phenyl - N - beta - naphthyl hydroxyl amine (not hitherto described in the literature), is a powerful inhibitor of the process of oxidation of rubber (Fig. 10).

This is also an indirect indication of the radical character of the cases we have described of the process of low-temperature structurization (vulcanization) of rubber.

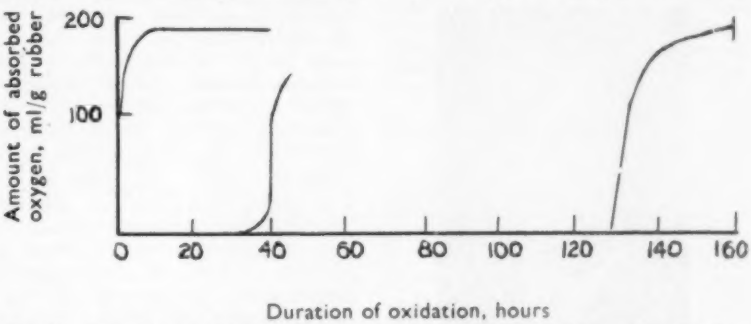


Fig. 10. Kinetics of oxidation of natural rubber at 140° C. without the addition of inhibitor (1), with an addition of 1% phenyl-beta-naphthylamine (2), and with an addition of 1% O-benzoyl-N-phenyl-N-beta-naphthyl hydroxyl amine (3)

Conclusions

1. By elementary sulphur, liberated in the nascent state at room temperature the reaction of dibenzthiazyl disulphide with hydrogen sulphide, of benzoyl peroxide with hydrogen sulphide and sulphur dioxide with hydrogen sulphide, does not bring about vulcanization of rubber. In the case of the system dibenzthiazyl disulphide/hydrogen sulphide there is combination of sulphur in amounts 1.2 to 1.6% with a small portion of the rubber, not leading to a cure. The main part of the rubber (about 90% by weight) does not, according to spectroscopic analysis undergo change. The combination of sulphur with rubber observed in this case takes place, apparently, according to an ionic mechanism.

2. Low-temperature vulcanization of rubber by the system dibenzthiazyl disulphide / hydrogen sulphide becomes apparent on prior irradiation of solutions of rubber containing disulphide with diffuse or ultraviolet light. The rate of vulcanization depends upon the time of irradiation and is governed by the interaction with the hydrogen sulphide of the polymeric rubber radicals, formed as a result of the dehydrogenation of the rubber by the benzthiazyl radicals. These are formed in the photodissociation of the disulphide.

3. Structurization (vulcanization) of rubber by the system benzoyl peroxide / hydrogen sulphide is observed in the presence of an amine, in particular phenyl-beta-naphthylamine. This is necessary for the formation of free benzoate radicals as a result of the reaction of the peroxide with the amine. The peroxide in the present case acts similarly to the benzthiazyl radicals in the case of the system dibenzthiazyl disulphide/hydrogen sulphide.

4. Peachey type low - temperature vulcanization (sulphur dioxide/hydrogen sulphide) proceeds in the presence of the peroxides of the rubber itself. Prior heating of rubber solutions inhibits vulcanization.

5. In the vulcanization of rubber by the systems dibenzthiazyl disulphide/hydrogen sulphide and benzoyl peroxide/hydrogen sulphide combination of sulphur with the rubber in amounts of 0.6 to 0.7% and a considerable loss of double bonds, reaching 60% for 1:4 type bonds and 75% for 1:2 type bonds, is observed.

6. Radical chain interaction schemes are put forward for the processes of low-temperature structurization (vulcanization) of rubber by the systems dibenzthiazyl disulphide/

Continued on page 86

J. V. Crossley Retires

Mr J. V. Crossley, who was appointed Commercial Director of I.C.I. Plastics Division in 1952 and

J. V. CROSSLEY

subsequently became Home Sales Director in 1957, retired on December 31 1959. Mr Crossley, very well known and greatly liked in the plastics industry, was chairman of the Council of the Plastics Institute during 1957-59. He is a member of the Council of the British Plastics Federation and chairman of its Publicity Committee, positions unaffected by his retirement.

A native of Huddersfield, Jim Crossley attended Leeds Grammar School and graduated at Leeds University in 1922. He then became a technical sales representative with Badische Anilin- und Soda-Fabrik, and subsequently of I. G. Farben. After extensive experience in the I.C.I. sales organization, which he joined in Glasgow in 1940, he was appointed Regional sales manager of the Plastics Department of I.C.I.'s Scotland and Northern Ireland Region in 1945. Three years later he took over the control of the Dyestuffs Department in the same region and in addition became assistant regional manager in 1949. He was appointed a director of Plastics Division in 1952. He is a keen member of the Plastics Industry Golfing Society.

Rubber Market in KL

INCREASES AND SHIPPING FACILITIES IN MALAYA

RUBBER trade circles have called for a rubber market to be established in Kuala Lumpur. They were commenting on the fact that Malaya in 1959 became the world's leading exporter of natural rubber. These sources said that there was a growing realization of the need for such a market in Kuala Lumpur which was the centre of production. But they stressed that such a market was unlikely to come into being overnight.

One source said that there was no doubt that brokers and traders in Kuala Lumpur were unwilling to continue to be completely dependent on Singapore for a rubber market. He added that in view of rising production and exports a rubber market here was inevitable.

A Government source said that the tonnage of rubber shipped overseas direct from Malaya would increase when the port development project in the North Klang Straits, near Port Swettenham, was completed. He added that Malayan ports were doing all they could in shipping rubber abroad but their facilities were at present limited compared with Singapore. Once their North Klang Straits project was completed, however, they would be able to handle considerably more shipments than now.

Peroxides in Carbon Black

This subject is discussed by V. A. Garten and K. Eppinger (Division of Physical Chemistry, C.S.I.R.O. Chemical Research Laboratories, Melbourne) in the Australian Journal of Chemistry (Vol. 12, No. 3, 1959, pp. 394-406).

An account is presented of a systematic study on peroxidation of a selected carbon black and it is shown how the data are in accordance with the phenol-lactone-chromene concept of carbon black chemistry.

The varying ability of carbons to oxidize Fe^{++}, to produce H_2O_2 when exposed to air in an acid medium, and to form a latent photographic image, has been studied on a graded set of carbon blacks. Mechanisms are discussed for these three types of activity and it is shown how they agree with the phenol-lactone-chromene concept of carbon black chemistry.

PI EDUCATION FUND

The Trustees of the Plastics Institute Education Fund have awarded training grants to 18 students following full-time courses. In addition, the following annual scholarships have been granted or renewed:

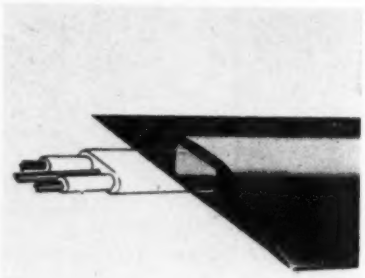
Diploma in Technology (four years sandwich course): Borough Polytechnic (four at £150), Brunel College of Technology (five at £175), College of Advanced Technology, Birmingham (six at £150).

Associateship of the Plastics Institute (three years' full-time): National College of Rubber Technology (three at £300).

Diploma of the Plastics Institute (two years' full-time): Borough Polytechnic (three at £100).

Rubber Strip for Cables

A rubber strip for protecting trailing electrical leads, which may be the cause of accidents, has been manufactured by Vulcascot Ltd., 87/89 Abbey Road, N.W.8. The protective strip, wedge-shaped in cross-section, has a rectangular core right through



it to house the cables and a flat face which is corrugated to make it adhere to the floor. It is produced in lengths of up to 30ft.

If the ends of the wires are not accessible, the underside of the strip can be slit along the centre of the core to admit the wires.

LOW TEMPERATURE VULCANIZATION

Cont. from page 85

hydrogen sulphide, benzoyl peroxide/hydrogen sulphide and sulphur dioxide/hydrogen sulphide.

7. The reaction of benzthiazyl peroxide with phenyl-beta-naphthylamine has been studied. A new compound, O-benzoyl-N-phenyl-N-beta-naphthyl hydroxyl amine, is obtained, which is a powerful inhibitor of rubber oxidation.

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Canadian Rubber Forecasts

ACCORDING to leading officials of the Canadian rubber industry, the year 1960 is expected to produce higher results for the industry as a whole thus continuing the improved demand for rubber products generally during 1959. Demand during 1959 had been very favourable for both the new vehicles as well as for replacement.

L. E. Spencer, president and general manager of Goodyear Tire and Rubber Co. of Canada, said that the current momentum of business certainly indicated that much higher and even new record levels of the business upswing would be reached in the first and second quarters of 1960. For the year as a whole, he said: 'we estimate that the gross national production may reach as high as $40,000,000,000.'

James P. Anderson, president of Dunlop Canada Ltd., said that with the advent of compact automobiles and the progressively increasing vehicle population in Canada, 1960 should be an even better volume year for the tyre industry than 1959 — itself a record — in spite of some loss of vehicle production in the last quarter due to the US steel strike. The price of natural rubber was at a higher level than it had been for several years and with increased labour costs and freight and other charges, may lead to higher prices during 1960. The rubber products industry had been suffering from increasingly severe competition from imported products and there was growing anxiety about the volume of these imports, particularly of some kinds of belting for which the tariff rates were unduly low and which had forced Canadian prices down, in many cases, to uneconomical levels. Representations were made before the Tariff Board and the industry was hoping that some relief may be forthcoming, Mr Anderson said.

Outlook Favourable

T. M. Mayberry, president of Firestone Tire and Rubber Co. of Canada, noted that, traditionally, the rubber industry had kept pace with Canada's economic activity generally and this past year had been a good one for most Canadians. The outlook for 1960 was also very favourable. He also stated that 'In an industry which had been highly competitive, they could foresee continuing pressure on profits in 1960 with increased material costs and high taxation and interest level. The most important single development within Firestone of Canada in 1959 was the decision to build the first complete tyre manufacturing plant in Western Canada in Calgary, Alberta. This plant would be in operation next autumn to serve the growing Western Canada market with a complete line of passenger, truck, bus, farm and implement tyres.

E. R. Rowzee, president of crown corporation Polymer Corporation, declared the outlook at the present time was better than it appeared to be at this time last year. It provided a basis for a good level of business in 1960, particularly if major strikes could be avoided. Employment and the general economy should be strengthened by the trend toward a more realistic stand by management against the efforts of labour to encroach in the management field and against the assumed right to annual wage increases whether or not earned by increased productivity. The boom in Europe should be a positive factor in the Canadian export situation, but since international trade involved two-way movement, strong economic pressures for the importation of foreign made goods would also be created. The six-country European Common Market had become a reality. The effect of this economic union along with the seven country 'Free Trade Area' in Europe would create problems for Canada and other countries which export to European markets. The advent of the North American compact car should be a stimulus to 1960 business.

R. V. Yohe, president of B. F. Goodrich, Canada, Ltd., declared that it could safely be predicted that 1960 would be the best year in Canadian economic history and the rubber industry would perform a little better than the economy as a whole, mainly due to the continuing increase of cars on the road and to increased use of rubber products in capital expansion of basic industries.

US Cars Use Polythene

IN what is claimed to be the first major use of linear polythene by the automobile industry, Ford's 1960 models introduce plastic front-seat side shields at only two-thirds the cost of the painted steel stampings previously used.

Polythene side-shield on the 1960 Ford

Representing a cost saving of approximately 30% per application and a weight-saving of 2.8lb. per car, this application of moulded Marlex may represent the technical breakthrough in automobile manufacturing that exponents of plastics have predicted for a number of years. The US auto industry is stated to have saved an estimated $3m. last year by using plastics in minor applications, and the new seat-shield item alone is expected to save Ford a substantial sum.

After ten months of development work with Phillips Chemical Company, producers of Marlex, Ford engineers reported that the side shields, injection moulded in one operation, gave a lower piece price, lower tooling price, styling advantages, lighter weight, increased scuff resistance and increased denting resistance in comparison with stamped steel.

Vinyl at Sea

A temporary protective covering has been devised to prevent wear and tear on the expensive flooring of ships in dock. This is 'Marleycloth,' a lightweight material that can be put down and taken up whenever protection is required. 'Marleycloth,' produced by the Marley Tile Co. Ltd., Sevenoaks, is manufactured from vinyl with a stout hessian backing.

US Stockpile Sales

The General Services Administration, USA, has announced that December sales of crude natural rubber from the US National stockpile totalled 6,930 tons. Including December, total sales from the stockpile since the disposal programme began on October 16 last year were 19,580 tons.

Epoxides in Perspective

IMMENSE POTENTIAL—MANY FIELDS

(Concluded from January 9 issue, page 41)

AN interesting, and increasing, outlet for epoxide resins, is in the repair kits now available on the market for effecting structural and mechanical repairs. These have been developed to meet the need for a method of quickly and inexpensively repairing a 101 items such as plating, piping and machinery parts and come in two forms:

(a) Epoxide adhesives and putties for filling cracks, holes etc., and (b) structural repair kits.

In general structural repairs are carried out by the application of resin to a cleaned, dry metal surface, bedding down a layer of glass-cloth and building up a thickness until a sufficiently strong mend has been completed. Where necessary the surfaces of the reinforced resin can be sanded-down to conform with the contours of the surrounding area.

These two resin reinforced glass fibre tanks nest together to make a jacketed unit with an oil space, designed for heating with a steam coil

Laminating and Chemical Resistance

There are many good reasons for the increasing interest being shown in epoxides in the laminated plastics field for, in addition to their good weight/strength ratio and chemical resistance, they also enjoy the following advantages:

(a) Adhesion to a wide variety of reinforcing materials including glass, synthetic, mineral and vegetable fibres.

(b) Low volume shrinkage.

(c) Good resistance to heat.

These properties immediately recommend the laminates for a large number of structural applications such as radomes, pipes, tanks and pressure vessels—to mention just a few.

While it is not proposed to deal with the methods employed in the making of laminates, details of which are readily available from the resin manufacturers, it will perhaps be of interest to consider the following recent application which illustrates the intelligent application of epoxide/glass structures to meet a particularly difficult industrial problem.

In the reconstruction of drainage systems at Battersea Generating Station about 1,000 ft. of large diameter reinforced epoxide pipes were used. These pipes replaced existing ceramic pipes in a system which carries effluent from the flue-gas washing plant to a treatment unit from which the effluent is eventually discharged into the Thames. Among the problems was one involving the handling of the acidic effluent and the abrasive nature of the large ash particles.

All the new pipes, manhole covers and fittings (manufactured and installed by Mendip (Chemical Engineering) Ltd.), were made from Bakelite epoxide resin reinforced with glass fibre and Terylene, the latter giving added abrasion resistance to the inner surface of the pipes. The pipes were produced in 10 ft. sections, each section weighing about 90 lb. and capable of being easily handled by one man. As most of the pipework was installed in concrete trenches it was found easier to join two lengths on site before lowering into the trench and all joints between sections of epoxide pipe were of the spigot and socket type, bonded with an epoxide/glass composition.

Laminating is a most promising field for the future. At present, investigations are being carried out on new mechanical laminating techniques with particular reference to spray applications of resin and reinforcement. The advantages of pre-impregnated materials are also being considered. Once these developments become standard practice it is certain that many new fields for epoxide laminates will be found.

Adhesives and Coatings

The properties and applications of epoxide adhesives are so well known that they need not be mentioned here, except perhaps to record the invaluable contribution they have made to many new manufacturing and assembly techniques.

Surface coatings based on epoxide resins comprise one of the biggest outlets for the material and these generally take the form of what is known as 'solvent based' coatings. These coatings, which include epoxide based paints, are systems for decorative and industrial applications and rely on the use of solvents as a medium for dispersing a thin coating of epoxide on the treated surface.

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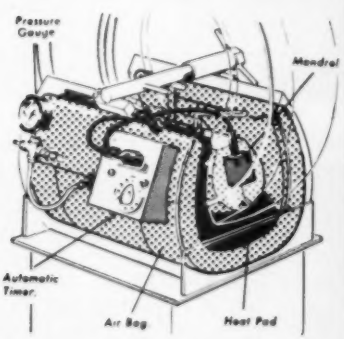
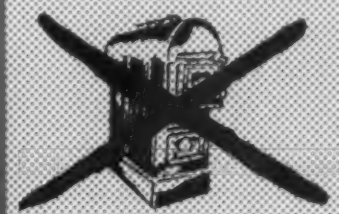


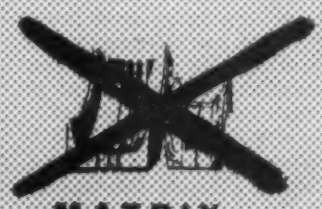
TYPICAL SECTION

MODEL M.P.B.

AIR BAG



BOILERS



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can be applied to a variety of materials such as steel, tin-plate, wood, masonry, and paper. Methods of application include brushing, spraying, dip-coating and flow-coating and typical uses are for drum linings, industrial primers, linings for chemical plant, and decorative finishes for phenolic mouldings, concrete and masonry.

A significant development in the coating field was the introduction of the solventless types of coating which give a thick, filled coat that needs no polishing or finishing. These coatings successfully overcome the problem of mechanical damage associated with the solvent-based coatings because they can be applied in thick layers. Much interest has already been aroused in this development (particularly in connection with its application by various types of spray apparatus) because, by adding fillers such as sand and slate dust, specially tough, chemical and water resistant coatings are obtained.

What of the Future?

Two questions which are often posed in any discussion on the future of epoxide resins are (a) what can be done to reduce the price and (b) what new outlets are on the horizon.

Question (a) is a fair one because epoxide resins, in spite of being essentially high quality materials, are expensive when compared with other basic plastics materials. It must be remembered, however, that the resins are based on expensive chemicals and, while there might well be a drop in price of say 10-15% by virtue of increased production or drop in price of the basic chemicals, it is not likely that on this score they could be reduced to the price of, for example, polyester resins. Again, epoxides are comparatively new materials which have resulted from a considerable amount of expensive development work by various manufacturers and it would be accepted by most people that these manufacturers are entitled to some return on their considerable capital outlay.

In spite of these facts, however, the picture has a brighter side because, although the basic price of the resin cannot probably be much reduced, one company, Bakelite Ltd., has recently introduced a new series of low cost hardeners. This is of the utmost significance because, of course, it is the price per mix which is the really relevant factor. Put another way, as these hardeners can comprize up to 50% of the mix (coupled with the fact that the lower viscosity resins can also accommodate non-expensive fillers) very substantial reductions in overall costs can be achieved.

Finally a word about future developments. There are bound to be many new outlets when a material has such an important combination of properties as epoxide resins and it would be impossible to indicate even a fraction of these outlets. There have been recently, however, two developments of exceptional promise.

The first of these concerns the use of epoxides to produce non-skid, durable road surfaces. In conjunction with the Road Research Laboratory at Harmondsworth, work goes on to evaluate the potentialities of epoxides in this field and formulations have been applied to surfaces such as concrete, timber and asphalt. Results to date have shown promise. It is not visualized that the material would be generally adopted as a road surfacing material but will probably find many outlets on bridge deckings, trunk roads, or areas such as bus stops subjected to severe stresses. In spite of this comparatively limited field, however, the potential could be immense if the material is found suitable for the job. Hand in hand with this work is the use of similar materials for marker strips and pedestrian crossings.

The other development is one which is already established in the UK and concerns a new epoxide based material called Permagile. This substance is capable of welding masonry materials and, as tests have shown, can be used for repairing fractured masonry so that the join is actually stronger than the rest of the material. This type of material is another example of the move towards premixed, ready-to-use materials and their importance lies in the fact that they can be used, literally, for a thousand and one jobs both in industry and in the home. They come in three basic forms:

1. As a mortar for floor surfaces to withstand hard, abrasive wear and for repairing badly cracked floors.

2. As a welding paste which can be used as a permanent waterproofing medium where resistance to hydrostatic pressure and water seepage is desired. It is also ideal for applying to gulleys, piers, foundations or any surface that needs protection against chemical corrosion *e.g.* chemical tanks.

3. As a self-levelling liquid for all horizontal surfaces which require water proofing or skid proofing—the latter being achieved by incorporating abrasive fillers into the mix.

Twenty feet of large-diameter elliptical pipe made by Mendip (Chemical Engineering) Ltd. from Bakelite epoxide resin, about to be lowered into a trench at the Battersea 'A' (London) generating station

These are just a few of the uses which immediately suggest themselves for this material and, in the hands of the professional builder and engineer, it can be confidently anticipated that many new and ingenious uses for the material will be discovered. One thing is certain, these materials fully exploit the properties of epoxide resins and are a significant pointer to the fact that much can still be expected of epoxide systems in the not-too-distant future.

Mr F. W. Harper has been appointed a director of Tanah Datar Rubber Estate.

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VIEWS and REVIEWS

Influence of Water on quality of Rubber

A PAPER on the 'Influence of Water on the Quality of Rubber' by K. F. Heinisch, which is well worth careful perusal, appears in the *2nd Quarterly Journal* (Vol. 35, Part 2; June 1959, p. 32, pp. 32 to 37) of the *Rubber Research Institute of Ceylon.*

The author reminds us that at present NR is commercially regarded on the basis of visual appearance, and this is usually influenced by factors such as colour, texture and visible contaminations. As the quality of 'factory' water used during the manufacture of rubber of NR has 'a very great effect on these factors, as well as on the intrinsic properties of the final product, it is most appropriate to discuss in some detail this subject which is generally overlooked.'

Quantity Used

A considerable quantity of water is used in 'manufacture' of rubber. One may estimate the total quantity used per kilogram of rubber at 30 to 50 litres for sheet and 60 to 80 litres for crepe. The quality of the water used at various stages of manufacture (dilution of latex, solution of chemicals, rinsing on the rolls, leaching, cleaning, etc.) are different, but 'in practice these have not been expressed precisely, and opinion on the subject may differ considerably.'

Generally, it is only stated that pure clean water, devoid of colour and smell is required, and that it should not contain too high a concentration of salts (especially those of iron, manganese and calcium). There is, however, no objection if the water used for rinsing and cleaning is opalescent, but it should be free of suspended matter.

Standards

In a recent publication from the *Research Institute of the Sumatra Planters' Association* (formerly 'General Research Station of the AVROS') a formulation of the quality requirements with suggested maximum limits has been given based on several years of practical experience.

The standards as applied by the above-mentioned Institute and with which the RRIC can agree, are as follows:

Iron	1 mg./l.	for crepe
	3 mg./l.	for sheet
Copper	0.5 mg./l.	
Manganese	0.5 mg./l.	
Permanganate Value	20 mg./l.	
Lime Content	50 mg./l.	
Bicarbonate	300 mg./l.	
Hardness	6°D	
Floating Dirt	10 mg./l.	smaller than 325 mesh
*p*H	5.8-8	

The above specifications are not to be considered as fixed upper limits but rather as a general guide. Only after a full analysis and a study of the local conditions will it be possible to assess the quality of the water.

Sources of Supply

The different types of water available are as follows:

Artesian water. This type is water that is clean and free from micro-organisms, but it may contain a high concentration of iron, manganese, bicarbonate, sulphur, calcium, or may be too hot for immediate use.

Well water. . . . If not contaminated by soil water and surface water it has usually the same properties as artesian water.

Soil water. Penetrating surface water which collects on water impermeable layers and forms a water-stagnant horizon. Such water is usually contaminated with organic and inorganic matter.

Running surface water from rivers or streams contains floating dirt. However, the extent of the impurities depends on seasonable circumstances, and that a river which is muddy in rainy weather may in dry weather have a water which may be used without any treatment.

Standing surface water from lakes or swamps is normally contaminated with floating dirt, and may sometimes have a high concentration of different salts.

Brackish water is a mixture of sea and river water at the mouth of rivers.

Effects of Iron, Copper, etc.

The effects of iron, copper and manganese on rubber generally have lately been the subject of discussion on this page and elsewhere. The author of the present paper discusses these and particularly iron at considerable length, and I suggest that readers of these lines who are specially interested, should read his remarks. I regret that there is not room for them here, but I will deal with his remarks on other impurities, and on Iron in Latex.

Permanganate Value

The permanganate value of water is generally taken as mg. of potassium permanganate per litre of water, and as an expression of oxidizable organic matter. Water with a high content of organic matter is always 'heavily infected' by micro-organisms, and this creates a favourable environment for fungi and moulds. This mould does usually not manifest itself until the rubber is 50% or so, dry, and is difficult to remove. Stains of various colours can originate on crepe as a result of micro-organisms. The author deals further with the results of the presence of mould.

'Dirt'

Mechanical impurities, including coarse organic matter of a particle size greater than 325 mesh (the maximum standard of size in rubber), should be avoided. (The author also deals with Lime, Hardness and Bicarbonates.)

Effect of Iron on Latex

If iron-containing water is mixed with latex, precipitation takes place, and red-brown spots resembling fungi are often observed on crepe rubber. In contrast to rust particles from water pipes, these spots do not have the same characteristic shape.

('It has been stated by several workers that iron has a relatively harmless effect on the intrinsic properties of

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

rubber compared with copper and manganese. However, it must be born in mind, that under certain circumstances a mutual activating effect between manganese and iron may appear, of which not much is known. For this reason no limits of the iron content of rubber have been fixed by the Rubber Manufacturers' Association of New York.' (*Cf. RJIP*, 1959 *December* 5; *p.* 726.)

Tyre Reinforcing Materials

Rubber World for November 1959 (141, p. 229) contains an interesting paper by C. A. Litzler (Pres., C. A. Litzler Co.) presented before the Rubber and Plastics Division, ASME, St. Louis (Mo.) on June 1959, the subject being 'Tyre Reinforcing Materials other than Rayon or Nylon.' The motif of the paper is a description of the newer—and potential—materials for which the urge for better tyre carcass materials is going on ceaselessly. These developments have resulted in a considerable increase in tyre cord and cord fabric dependability which results in greater mileage, increased tyre safety, and generally improved tyre performance.

In his summary the author says that 'this paper has been a sincere attempt to provide an objective analysis of current developments and future probabilities in tyre cord fabric and tyre construction. It is based on information reported by persons of authority with every effort made to deal only with confirmed data.

'Discussion of future developments is subject to the usual limitation, *i.e.*, that the data made available by individual companies may not be absolutely complete owing to confidential instructions.'

Conclusions

The conclusions reached by the author are along the following lines:

1. Cellulosic fibres, 'since their technical reincarnation' —I presume this refers to the great improvements in that line—are providing a serious come-back for the tyre market.
2. Nylon 66 materials will continue important technical advances and commercial gains in the premium tyres in passenger and other sizes.
3. Wire reinforced tyres will probably double in output in the next few years; emphasis will be on bus and town lorry 'on firm and relatively smooth pavement (*i.e. road*) surfaces.'
4. Improved caprolactam—based fibres will increase in volume 'in near-direct proportion to the cost of this material in comparison to cellulosic and amide materials.'
5. The other newer and commercially untried materials mentioned will certainly make a strong future bid for the large markets for tyres. The polyesters, most probably, will be the first of the serious contenders. . . .

'Caprolan'

The following are some of the properties of 'Caprolan' as described by the author:

'. . . "Caprolan" differs from nylon 66 in a few basic respects. It has a lower melting point and somewhat lower retractive forces, but better tensile strength retention of properties at elevated temperatures, when compared with nylon 66.' After giving various other tests, too numerous to mention here, he mentions that '"Caprolan" has favourable high-temperature characteristics which contribute to this material's importance in the tyre cord field, and its ability to retain tenacity at elevated temperatures is comparatively high.'

(*Note:* From the introductory statement that 'An improved "Caprolactam"-based fibre known as "Caprolan" is now in production and use in tyre production in the United States. . . .' With a footnote to Allied Chemical, one gathers that the material now described is a new version of an older material.)

PHILIP SCHIDROWITZ

Pirelli's 50 Years

IN May 1909 In Basinghall Street, in the City of London, Pirelli Ltd. began operations. At first the company was concerned solely with the import and distribution of cables, tyres and footwear made by Pirelli, Milan. In 1912 it moved into larger premises in Queen Victoria Street, London, and by 1914 a new factory had begun production of electric cables of all kinds at Southampton. This was the beginning of Pirelli-General Cable Works Ltd., a company which has multiplied in size many times since those days. One of the notable technical developments in the electrification field, pioneered by Pirelli, was the 330,000 volt cable. This today is still known by the name of its inventor, the late Mr Luigi Emanueli, who was one of Pirelli's top scientists.

World War I interrupted expansion and it was not until 1929 that production got under way at a new tyre factory in Burton-on-Trent. There, one of the main products was the semi-pneumatic tyre, a Pirelli speciality. Tyres for cars and commercial vehicles were produced in ever-increasing quantities as the years passed, and included spectacular contributions to motor racing from 1906 up to 1957. Then the company decided that the time was ripe for a concentrated drive on what was to prove a revolution in tyre development—the BS 3 tyre—introduced in November 1959 (*RJIP* November 7 1959), the world's first tyre with replaceable treads.

In 1934 Pirelli began the manufacture of 'leisure' footwear using a moulded foam rubber sole and heel bonded to the upper; a type of construction pioneered by Pirelli.

Today the factory at Burton-on-Trent manufactures tubeless tyres for cars, tyres and inner tubes for cars, commercial vehicles and buses, and scooter tyres and tubes for the increasing number of scooter users in Britain and abroad. Another product, Pirelli resilient webbing, is proving tremendously successful. Production first commenced in 1954 and today a high percentage of all cars produced in Britain use Pirelli resilient webbing in the construction of their seats. The Boeing 707 jet airliners on order for BOAC will also have seats based on this webbing.

For the past four years, a large-scale programme of modernization and expansion has been taking place at Burton-on-Trent, and the new tyre plant is now in full production. A new footwear factory is planned. The expansion of the webbing factory is continuing. This month new machinery and methods have been introduced for the production of BS 3 tyres—a development which alone ensures Pirelli its well-earned place among the great technical innovators of the present century.

Questions Corner—100

(Second Series)

419. Acrylonitrile is used in the production of synthetic fibres. Give some details.

420. How important is the design of the nozzle in injection moulding machines?

421. Give some account of the manufacture and uses of Tri-tolyl phosphate.

422. How would you select the proper raw materials for the production of nitrocellulose lacquers?

(Answers next week)

Answers to Questions Corner—99

415. Polysulphide polymers are one type of synthetic elastomers that give excellent resistance to oils and solvents and, because of their saturated structure, they have good light, oxygen and ozone resistance.

The first elastomer of this type was made by reacting ethylene dichloride and sodium tetrasulphide in 1927, and was named Thiokol A when introduced commercially in 1930.

There are, of course, improved elastomers of this type since that date in the form of solid elastomers, latices and curable liquid polymers. They are prepared by the condensation of an organic dihalide (usually a chloride) with aqueous sodium polysulphide.

There are a large number of halides that are suitable including thylene dichloride, methylene dichloride, glycerol dichlorohydrin, dichloroethyl ether and dichloroethyl formal.

Emulsion polymerization is the method of forming the elastomer and either sulphuric acid or acetic acid is used as the coagulant when the solid material is required. After coagulation the polymer is dried under vacuum and sheeted out on a rubber mill.

The polysulphide elastomers have a strong characteristic odour which is influenced by the presence of low molecular weight diothols, stable cyclic compounds and polymerizable cyclic compounds. In the thiol-terminated polymers, conversion to high molecular weight materials, by oxidation, removes volatile diothols and reduces odour (Ind. Eng. Chem. 1950, *42*, 2217).

For Thiokol A, ethylene dichloride is the halide used, for Thiokol FA ethylene dichloride and dichloroethyl formal and for Thiokol ST, dichloroethyl formal.

Thiokol A is used where low swelling in solvents is required, low moisture absorption and good water resistance.

Thiokol FA has good resistance to ketones, esters and most aliphatic and aromatic solvents. It is very impermeable to gases, water, organic liquids and is practically unaffected by ozone, light, etc.

Thiokol ST is interesting in the fact that it is not thermoplastic after vulcanization and its low temperature characteristics are good and plasticizers are unnecessary to maintain the flexibility down to about −60°C.

Because of the 2% content of cross-linking agent it is too tough for processing on conventional equipment and a reduction of the molecular weight by cleavage of the disulphide links is used.

416. Measurement of viscosity is a useful method of determining the degree of polymerization and can be used both in the laboratory and for plant control.

The measurements can be made with the resin in the form of either a solution of the reaction mixture, or the resin can be separated and re-dissolved in a suitable solvent or the resin layer can be separated from the aqueous layer.

Viscosity varies with temperature and concentration of the resin so that it is important to keep the conditions to a given standard.

Amongst viscometers that can be used are: Stormer Viscometer. In this apparatus the liquid is placed in a cup in which a cylinder is suspended. The cylinder can be rotated by a constant torque. The time required for 100 revolutions of the rotating cylinder is determined and is a measure of the viscosity of the liquid.

Ostwald Viscometer. This instrument is in the form of a U-tube and one arm consists of a capillary tube and a bulb reservoir near the bottom. A definite volume of the liquid is placed in the instrument and the time required for a given portion to fall through the capillary from the upper reservoir to the lower one, under gravity, is measured.

Brookfield Viscometer. In this instrument a disc or spindle rotates immersed in the liquid and rotated at a constant speed. The viscosity is determined by measurement of the drag given by the liquid. The spindle may be rotated at four different speeds and a series of interchangeable spindles are available so that it is possible to measure viscosities over a wide range (ca. 1cp. to 32 x 10⁶cps.).

Gardner-Holdt Bubble Viscometer. A sample is placed in a tube of standard size, leaving a small bubble of air, and stoppered. The tube is inverted and the time required for the bubble to rise is proportional to the viscosity of the liquid.

MacMichael Torsion Viscometer. In this instrument the viscosity of a liquid is measured with a torsion balance, and is calibrated with a liquid of known viscosity. The balance consists of two concentric cylinders, one of which rotates in an angular manner about the common axis.

Ubbelohde Viscometer. This is used for determining the specific viscosity of primary vinyl chloride polymers.

A sample of the resin is weighed and dissolved in nitrobenzene. The specific viscosity is calculated from the ratio of the kinematic viscosity of a specific solution of the polymer to the kinematic viscosity of the solvent.

417. The solvent method for the production of alkyd resins means that the resin is processed in the presence of a solvent which is immiscible with water. The solvent serves to control the reaction temperature. The reactants are diluted and the rate of reaction is therefore slower. This is useful in the preparation of short-oil resins where the reaction rate is quicker than in the preparation of long-oil length resins.

Other advantages are that this method results in a product of more uniform particle size of the polymer, and also by means of a separator, the water may be removed and the solvent returned to the batch.

418. Di-lauryl phthalate is used as a plasticizer for nitrocellulose to improve the heat and light stability. It is also used with mixed cellulose esters and cellulose ether but not with cellulose acetate with which it is of little use. It can also be used with polyvinyl chloride, and co-polymers, particularly where water resistance is of importance.

Di-lauryl phthalate ($C_6H_4(COO(CH_2)_{11}CH_3)_2$) is a high boiling plasticizer, light fast and with a faint odour. It has a characteristic pale yellow colour. Other properties are:

Molecular weight	502
Specific gravity at 20°C.	0.945
Refractive Index at 25°C.	1.482
Boiling Point, °C.	300
Melting Point, °C.	8
Viscosity/20°C./cps. ...	12
Soluble in water	Nil
Soluble in petroleum	

(More questions next week)

MEN *and* MATTERS

A Review of People and Events

THERE is news this week, announced in another part of the Journal, of a fresh rubber retirement of considerable interest and significance. At the end of the month Mr Archibald S. Bishop takes his departure as chairman of the directors of the Goodyear Tyre and Rubber Co. (Great Britain) Ltd., and so the industry loses, in active connexion at any rate, a man who can truly be described as one of its Elder Statesmen. I am happy to be able to add, however, that after all these years, he is to continue his links with the company as a director, and I, in common with a great many others, while wishing him many years of happy and healthy retirement in his home at Eastbourne, hope very much that he will not be lost to the service of the many trading organizations with which for two or three decades he has been so brilliantly associated.

Mr Bishop's career is set out factually in the official announcement of his retirement, but the bare facts ought to be clothed with something more descriptive of all that he has done to further the growth of the tyre industry, and the expansion of modern road transport within this country and abroad. This is the moment to recall that during his 44 years or so with Goodyear he has been responsible not only for pioneering the giant pneumatic tyre in this country, which marked the early twenties, but it was

by George A. Greenwood

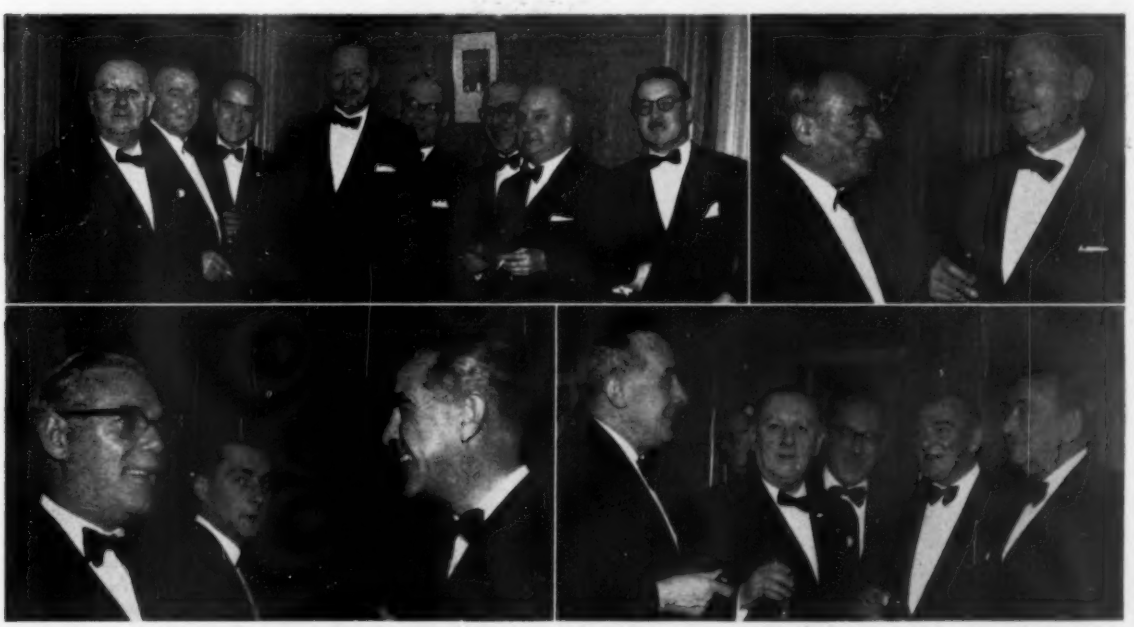
through his efforts that the first of these tyres were fitted to public service vehicles.

The Very First

Indeed, I and many others can recall the fact that Goodyear were the very first manufacturers to make and supply giant tyres to a passenger undertaking on a mileage basis. Since then, of course, he has done much, not only to lead the Goodyear organization to the level of its present-day achievements, but also a great deal towards influencing the formula for modern tyre trading. It has all amounted to something like a miniature Industrial Revolution within modern trends and Mr Bishop has seen many dealers and distributors, whom most of us know and with whom he worked in the early days, become leaders. He has seen also his own consistent policy of being of service to the user—and I say that quite definitely—become paramount in business building, and I need not add a word, for it is manifest for all to see and to know how very much, as a consequence of his own character and qualities, he has seen the Goodyear standards of fair dealing and straightforward business practice become universally recognized throughout the industry—making the name a byword both at home and abroad.

A Sportsman

I must not convey the idea, however, that he has lived, and lives, with his nose always on the grindstone, keeping other people's noses there too! He knows the value of leisure, and ever since I have known anything of him he has been a keen sportsman. He was president of



Those present at the P. B. Cow party referred to above included directors of the Group *(left to right, top left picture)*: **B. S. Davies, chairman of several associated companies, including Hertfordshire Rubber Co., W. J. Garner, retiring managing director, Charles Hawkins, Denzil H. Carlisle, chairman of the Group, A. S. Baird, W. C. Jenvey (Group secretary), Mark Heywood (technical director of the Group) and Cyril Smart, managing director, Hertfordshire Rubber Co. Ltd.** *Top right:* **W. J. Garner and Denzil H. Carlisle.** *Lower left:* **The new joint managing directors, A. S. Baird and Charles C. Hawkins.** *Lower right:* **Charles Hatley, B. S. Davies, Bill Jenvey, W. J. Garner and Wilfrid Smith**

Goodyear Cricket Club until 1957, a position he had held for 25 years; and the 'square' at Goodyear Park, considered by many players to be the best club pitch in the Midlands, owes much to his active advice and encouragement. He helped to sponsor the now well-known series of annual celebrity cricket matches at Goodyear Park, and he is also a keen supporter of Soccer, being a regular Wolves follower during his many years at Wolverhampton.

Once more, then, all good wishes to 'The Archbishop,' in the new leisure which he is taking and which we all hope will be fruitful of happiness and content.

P. B. Cow Party

A notable dinner party last week was that given to mark the retirement of Mr W. J. Garner from the managing directorship of the P. B. Cow Group. Present, besides Mr Garner, were Group directors and the Chairman of the Group, Mr Denzil H. Carlisle. A number of directors of associated companies were also at the Café Royal, London, as was Mr Charles Hatley, another P. B. Cow man now on the retired list. Apart from those pictured here, others who attended were Mr John Weir, sales director of the Hertfordshire Rubber Co., Mr A. Wrigley, sales director of Sorbo Ltd., Mr E. N. Crump, managing director of London Moulders and general sales manager of P. B. Cow on the consumer side, Mr F. Thompson, sales director of Acme Tin Stamping Co. and Mr Frank Garner.

Holiday Rise

One of the main objectives of organized labour is to establish ultimately a 40-hour week, and although the General Council of the Trades Union Congress has somewhat coyly disclaimed any intention of itself campaigning towards this end, it has issued a direct encouragement to the individual unions to go ahead with their demands, not to mention more holidays with pay.

Now comes news of the interesting and far-sighted way in which one of the big combines closely associated with plastics, the De La Rue group, has announced a spectacular increase in the standard annual holidays for its 5,000 personnel. The directors have decided that highly paid employees are to receive two days' holiday on top of their present two weeks' annual holiday; weekly staff holidays will be the same as hourly staff, but after two years' service they get an increase to three weeks a year; monthly staff, who at present have to wait five years for their two weeks' holiday to be increased to three weeks, will in future have three weeks' holiday without any service qualifications. These holidays are additional to those at Easter, Whitsuntide, August Bank Holiday and Christmas.

The De La Rue Group includes the De La Rue Company Ltd., Thomas De La Rue and Co. Ltd., Thomas Potterton Ltd., Formica International Ltd., of which Formica Ltd. is the United Kingdom subsidiary, and the De La Rue Bull Machines Ltd.

Submarine Cables Appointment

Mr F. W. H. Shaw, A.M.B.I.M., has been appointed managing director of Submarine Cables Ltd. Mr Shaw, who has been in the cable industry for over 40 years, was assistant engineering director of Siemens Edison Swan before joining Submarine Cables Ltd. in 1959 as deputy managing director. Educated at Woolwich Polytechnic,

F. W. H. SHAW F. S. H. LEMON

he was appointed assistant to the cable works manager of Siemens Brothers and Co. Ltd. in 1938. He was a director of St. Helens Cable Co. from 1953-58 and chairman of the CMA Technical Committee for the same period.

Mr Shaw succeeds Mr F. S. H. Lemon, O.B.E., who retires after over 40 years' service. As a member of the electrical staff Mr Lemon served on board cableships for 12 years, and took part in the maiden voyage of c.s. Dominia in 1926 when she laid the 3,467 nautical mile Vancouver-Fanning Island Cable.

Other Moves

There are one or two other changes to be reported. Sir Andrew Murray has been appointed a director and chairman of the Bukit Tupah Rubber Estates, from which Mr G. T. Day has resigned as chairman. Sir Andrew Hunter Arbuthnot Murray, O.B.E., Ll.D., a Knight of St. John of the Order of Jerusalem, is a prominent figure in Scottish political and public life, as well as in industry. He is one of the leaders of the Liberal Party and chairman of the Scottish Motor Traction Co. Ltd. and other companies.

Then Mr T. B. Knowles has been appointed a director of the Sam Kay Rubber Co. Ltd., a subsidiary of Sam Kay and Co. Ltd., and Mr George E. Beharrell has resigned from the board of the North British and Mercantile Insurance Co. Ltd., in order to devote his time more closely to his duties as chairman of the Dunlop Rubber Company. On another side of the picture, Dr B. Raistrick has been appointed a full-time executive director of Associated Chemical Companies as from April 1, Dr C. H. Clarke retiring from the board as from March 31, and Mr W. O. Heinze, president of the International Latex Corporation, announces the appointment of Mr Gordon A. Ogden to the post of executive vice-president (International Division).

MISSILE NOSE CONE

Vibrin 135, a polyester resin produced by the Naugatuck Chemical Division of the United States Rubber Co., is the material used in the manufacture of the reinforced nose cone that protects the US Air Force's Bomarc ground-to-air missile in its supersonic flight.

The plastic cones are formed by filament winding. In this, strands of glass impregnated with polyester resin are concentrically wound about a stainless steel form by a high-speed winding machine. With the winding complete, thermocouples are attached to the radome and the plastic is cured in an oven.

The surface of the cone is ground to precision tolerances for electrical requirements. Even radar transparency over the entire surface is insured by measuring the electrical thickness of the radome and grinding it to a uniform electrical thickness.

Vibrin 135 has a flat radar transparency curve over a wide temperature range, and this means that the plastic allows radar pulses to pass through it easily even when heat builds up during the high-speed missile flight. If its resistance to radar increased perceptibly at elevated temperatures, the missile would require built-in compensating equipment that would add to its cost and weight.

British Cellophane Distributors (Private) Ltd., have taken over premises in Salisbury, Southern Rhodesia, where machinery is being installed to produce cellophane and polythene for a wide range of uses.

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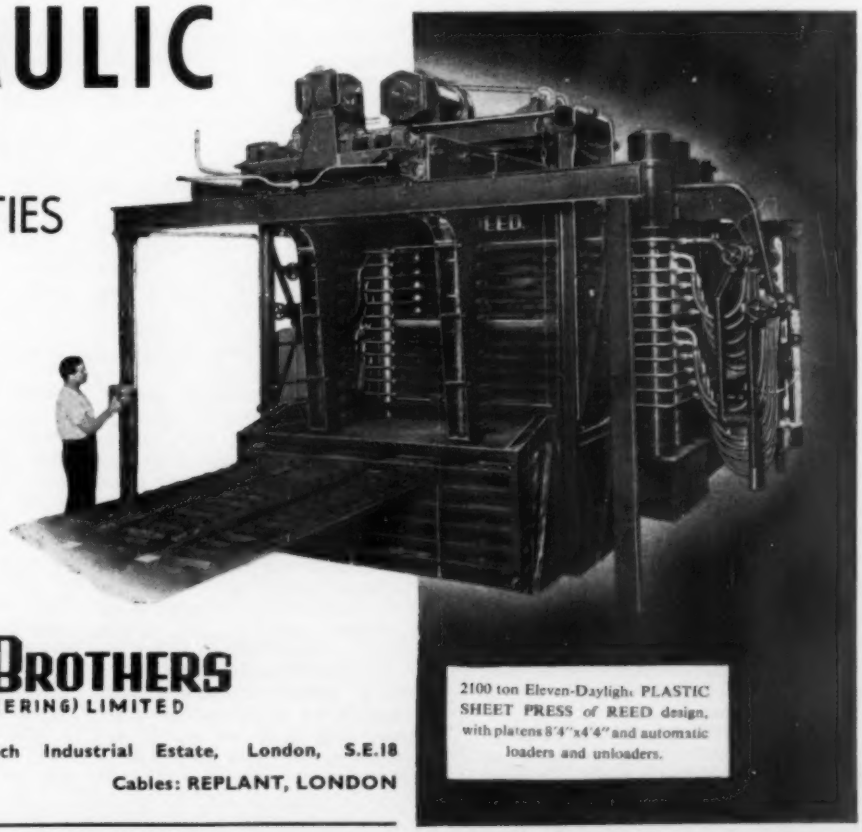

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Plantation Commentary

FRAGMENTATION — MARKETS — STIMULANTS

by our Malayan Correspondent

THE speech from the throne on the recent opening of Parliament here (written in Malaya, as it is in Britain, by the Government of the day) again laid great stress on Malaya's plans to promote land development over three-fifths or so of the country that is still under jungle. What it will finally mean in the way of rubber production is impossible to forecast as full details have yet to be worked out and indeed will not be known for many months, but it can hardly fail to be of considerable significance.

Smallholders produce less than half of Malaya's rubber, much of it in the lower grades, but most of the land settlement schemes that have been announced so far lean heavily on rubber as the bread-and-butter crop of the small farmer. Schemes have been announced for 10-acre lots with rubber making up seven acres and for eight-acre lots with rubber occupying six acres. On the scale that is envisaged by the Government these schemes are going to make a considerable difference to Malaya's smallholding production over the next decade.

Rural Development

The speech, read by the Deputy Paramount Ruler, referred to the need to give rural development the same urgency as the fight against the Communists which is now coming to an end. The 'efforts and resources of the whole country' are to be directed to rural development, both in starting new settlements and improving present villages with community development projects. The aim is to provide land for those who have none and to improve village life so as to stop unpleasant comparisons being drawn by rural dwellers with the relatively prosperous towns.

Related in many ways to the need for more local investment is a frank and carefully considered assessment of the dangers of fragmentation of estates to the Indian community by the president of the Malayan Indian Congress, Dato V. T. Sambanthan.

All Malayan estate managers know the Indian tapper, without doubt the backbone of the industry, a man who with his family takes to estate life which, although not luxurious, on the better estates means good houses provided by the estate, medical treatment, welfare and a general aura of security. Without stretching the point too far, this does lead to a kind of 'welfare state mentality' in a country where there is no welfare state.

Dato Sambanthan was careful to point out the dangers of this with estates, largely British-owned estates, agreeing to attractive bids for their property which is then usually split up into smallholdings of one kind or another and sold at a profit. In other cases, the thriftier villagers may save and co-operate in the purchase of an estate which can be run jointly by the villagers and their families. Either way, the Indian tapper loses his job and the estate amenities get lost in the general carve-up.

He told the congress: 'Fragmentation of estates is the biggest danger that is facing half the rural Indian population in Malaya.' If half of the money they spent on drink went into co-operatives for the purchase of rubber estates 10,000 acres of good land could be purchased every year.

Dato Sambanthan, who is also the Minister for Works, said that Chinese tappers were among those who lived thriftily until they could purchase land, but there were few Indians. Legislation against fragmentation, demanded by some congress speakers, was only a palliative and would not be effective. No matter how they tried to limit fragmentation, nothing could prevent 25 thrifty tappers (not Indians) getting together to buy up 250 acres of rubber with the result that the Indians would be displaced.

He offered to lead a move to start a co-operative into which every Indian tapper would put $10 a month (£1 3s. 4d.) if the Indian community would be positive in its thinking and accept the fact that land hunger was the basic reason behind estate fragmentation and that legislation would not prevent it.

There has unfortunately been little response so far to this outspoken speech. At present there is no shortage of work for a good tapper willing to go anywhere in Malaya, but this may not always be so. Now another Government committee has been set up to consider fragmentation.

The Malayan Government, as well, has shown itself keen to promote greater saving and to make share-owning a business for the small man as well as the businessman. For many years there has been increased purchases by Malayans of rubber estates and other shares in well-established British companies, so that imperceptibly rubber companies are increasingly Malayan in their ownership, one of the motives for the training schemes for young Malayans as estate managers.

Responsible opinion in the rubber producing industry is now largely united in being concerned with the continued high price for rubber and the inevitable effect this will have on manufacturers who find the stable price of synthetic more attractive than the flirtatious conduct of natural. The Government has long been concerned and in a recent speech to the economic committee of the General Assembly of the United Nations the Malayan delegate referred to Malaya being 'nakedly exposed' to commodity price changes. The Malayan delegate called for serious consideration of ways to prevent fluctuations which were creating a problem that could not be overemphasized.

The budget for 1959, for example, when it was prepared in November last year forecast a deficit of $114 million. Not unreasonably, it was based on an average price for rubber for the year of about 1s. 9d. a lb. Never once this year has the price of rubber fallen to this figure and the Treasury's estimate for the amount that would be collected on the export duty on rubber for the whole of the year was exceeded some time ago. The development programme that had to be curtailed earlier because it was thought, on the best advice, that rubber was likely to be low, is now busily trying to catch up.

Related to this condition was the presidential speech of the president of the Federation of Rubber Trades Associations in Kuala Lumpur, Mr Tee Teh, who seemed to see considerable advantage in Malaya branching out into her own rubber market, as distinct from using the Singapore and other markets.

Mr Tee Teh urged rubber traders to promote direct trade and said: 'Only then will it be possible to assess and take steps to meet the need for rubber without undue interference from outside speculation. Outside speculation often tends to confuse the issue and may eventually be detrimental to the stability of the rubber market which is of supreme importance to the prosperity of the country.'

Effect of Stimulants

An interesting theory that stimulants, among other helps, have been responsible for Malaya continuing to keep up rubber production despite cutting out large acreages for replanting, has been advanced here by the head of the botanical division of the Rubber Research Institute, Mr C. W. Brookson. Malaya is, of course, not only maintaining production but increasing it and expects to become the world's largest producer of natural rubber next year when output tops the 700,000 tons a year mark.

Mr Brookson said that estates all over Malaya were putting the Institute's ideas for stimulants and double tapping into effect. The great majority of the larger estates and more than 50% of the smallholding estates were using both stimulants and double tapping. The methods had also been adopted by smallholders through the Smallholding Advisory Service of the institute.

Many of the smallholders, particularly those who regard their crop as an investment, were achieving very

successful results. 'Care has to be observed where smallholders are concerned,' he said. 'for if the yield stimulation is done incorrectly it can cause a great deal of damage.'

Double tapping was not new to smallholdings but they were now given a rational, systematic method without the danger of 'slaughter' tapping by making too many cuts. He considered that the widespread use of these methods was compensating for the loss of production that must follow replanting about 15% of the rubber land.

The institute has been experimenting with yield stimulation since 1951. The results have allowed the institute to prepare recommendations for the use of stimulants in ordinary estate practice. The eventual aim is to increase the economic life-span of a tree to 35 years from the start of tapping.

A. S. Bishop

GOODYEAR CHAIRMAN TO RETIRE

MR A. S. BISHOP, chairman of the Goodyear Tyre and Rubber Co. (Great Britain) Ltd., and so well known to trade and industry for practically a generation, is to retire from active connexion with the company on January 31 next. He will, however, continue his long association with Goodyear by remaining on the board as a director, and so retaining an association which began so long as 44 years ago.

A. S. BISHOP

Mr Bishop, who was born at Tring (Herts), before the turn of the century joined Goodyear in 1916 after a long spell in hospital when he was recovering from serious wounds received in action in France. His first job with the company was as a clerk in the then solid tyre department, of which he later became manager. Following this he was appointed in charge of the commercial tyre department, handling giant pneumatics, solid and cushioned tyres and rim and wheel sales. Then, in February 1933, he became general sales manager.

Three years later, Mr Bishop was appointed to the board as sales director and it could perhaps be said that that was the real beginning of his more modern career and influence. Not only did he do so much to lead the Goodyear organization to the level of its present-day achievements, but he did, and has done, a great deal towards influencing the formula for modern tyre trading.

Since 1933 he has been prominent and tremendously active in the rubber industry, and in trade circles generally. He has been chairman of the Tyre Trade Joint Committee (an appointment he held for six years until 1953), a member of the finance executive and management committees and of the council of the Society of Motor Manufacturers and Traders, chairman of the tyre section of the S.S.M. and T., chairman of the T.M.C. Mileage Group, a member of the executive committee of the Motor Industry Research Association, a member of the council of the British Motor Trade Association and a member of the finance and management committees of the British Road Federation. For two to three years, 1956-1958, Mr Bishop was president of the Institution of the Rubber Industry. As president, of course, he had the right to attend all council and committee meetings of the IRI.

'X'Y

Michelin's 'X'Y—steel cord—tyres have solved a problem for C. A. Roe and Sons Ltd., suppliers of scrap glass. Loading up this glass means that the lorries' tyres are frequently rim deep in broken glass. Treads of textile tyres were either penetrated or stripped, and they lasted at most a fortnight. 'X'Y tyres, now used by the firm, are claimed to do over 60,000 miles.

The main reason for its success is said to be that the 'X'Y tyre's stabilized tread gives improved grip, and so reduces wheel spin on the slippery glass.

The US Department of Commerce announces that consumption of imported synthetic rubber in October 1959 amounted to 942 tons, compared with 758 tons in September.

Rubber Crop Returns

Unless otherwise indicated the figures quoted, to the nearest thousand lb., represent crop returns for the month stated and for the number of months of the planting company's financial year to date. Corresponding figures are given in parentheses.

HARRISONS AND CROSFIELD LTD.

November

Castlefield.—275 (220). 5 mths—1,372 (1,116).
Golden Hope.—780 (669). 9 mths—6,563 (5,622).
Holyrood.—84 (70). 11 mths—816 (709).
Hongkong.—25 (21). 11 mths—289 (226).
Hoscote.—234 (224). 5 mths—1,183 (1,175).
Killinghall.—42 (40). 5 mths—216 (202).
Kuala Selangor.—56 (46). 11 mths—583 (545).
Kulai.—168 (169). 1 mth—168 (169).
Lanadron.—497 (417). 11 mths—4,818 (4,326).
London Asiatic.—1,690 (1,383). 11 mths—16,631 (15,258).
Malaysia.—68 (42). 11 mths—581 (598).
New Crocodile.—230 (224). 9 mths—2,097 (2,097).
Pataling.—1,370 (1,105). 1 mth—1,370 (1,105).
Prang Besar.—253 (166). 8 mths—1,995 (1,425).
Sandac.—76 (74). 8 mths—635 (583).
Sapong.—166 (146). 11 mths—1,661 (1,492).
Seaport.—79 (70). 5 mths—349 (385).
Malayalam.—895 (844). 8 mths—5,165 (4,935).
Lunuva.—132 (142). 11 mths—1,172 (1,316).
Allied Sumatra.—779 (879). 11 mths—8,232 (8,664).
Asahan.—99 (130). 4 mths—392 (494).
Bah Lias.—159 (165). 1 mth—159 (165).
Central Sumatra.—77 (87). 5 mths—343 (466).
Lankat Rubber.—80 (62). 8 mths—527 (493).
Mendaris.—181 (214). 11 mths—1,984 (2,170).
Namoe Tongan.—239 (269). 3 mths—714 (809).
Sialang.—207 (200). 10 mths—1,963 (1,895).
Soengei Rampah.—45 (49). 11 mths—563 (543).
Tanah Datar.—71 (76). 11 mths—735 (841).
Tandjong.—154 (148). 5 mths—781 (743).
Toerangie.—187 (212). 1 mth—187 (212).
United Lankat.—30 (29). 11 mths—312 (336).
United Serdang.—919 (969). 3 mths—2,695 (2,990).

November

Bajoe Kidoel.—152 (184). 8 mths—1,587 (1,666).
Djasinga.—111 (128). 5 mths—515 (576).

December

Kuala Reman.—167.
Sungei-Timah.—54 (68). 9 mths—407 (444).

Shell to Yarsley

Effective February 1, it is announced that Dr Cyril Webber has resigned his appointment as technical assistant to the managing director, Shell Chemical Company Ltd., in order to take up directorships with Yarsley Research Laboratories Ltd. and Yarsley Testing Laboratories Ltd.

Rubber Statistics

JAPAN

THE Secretariat of the International Rubber Study Group has now issued details of the Japanese rubber position up to the end of August.

For the first eight months of the year, imports of natural rubber totalled 95,386 tons of crude and 9,176 tons of latex, making a total of 104,562 tons, an increase of more than 24,000 tons or about 30% over the 1958 import figure. The main supplier was Malaya, which sent 80,444 tons compared with the previous year's total of 70,646. Other countries sending appreciable supplies were Indonesia (2,077 tons), Thailand (6,775 tons), Ceylon (6,799 tons) and British Borneo (6,738 tons).

Consumption of natural rubber during these months amounted to 94,770 tons of crude and 9,020 tons of latex, the combined total showing an increase of very nearly 24,000 tons over the 1958 figure. Stocks at the end of August had risen to 14,555 tons of crude and 1,297 tons of latex, these having stood at 13,939 tons and 1,140 tons respectively at the beginning of the year.

Imports of synthetic rubber increased from 10,524 tons to 24,840 tons or nearly 2½ times, the USA supplying 22,079 tons and Canada 2,226 tons. Consumption of synthetic rose from 10,450 tons to 19,030 tons, while stocks at the end of August rose to 8,860 tons, having totalled only 3,050 tons at the beginning of the year.

Data just released by the Rubber Manufacturers' Association of Japan show that production of rubber articles in terms of crude rubber totalled 14,957 tons in November, showing little change compared with September. The main items included in this total were motor-car tyres and tubes, 5,388 tons; rubber shoes, 1,530 tons; and industrial uses, 1,882 tons. The Japanese Rubber Importers' Association has given preliminary details of natural rubber consumption excluding latex during October. This it puts at 13,160 tons, the September figure having been 13,000 tons. It also states that domestic stocks of crude rubber totalled 13,500 tons at the end of September, and estimated that they amounted to 9,130 tons at the end of October.

New Branch for Goodyear Distributor

Southern Industrial Rubber Ltd., the Southern distributors of Goodyear Industrial Rubber Products, have opened new premises at 7a The Green, West Drayton, Middx. Stocks of Goodyear hose, v-belts, transmission belting and fendering will be carried to improve service to customers in West London, Middlesex, Buckinghamshire, Berkshire and the Northern parts of Hampshire.

South London and the remaining South-Eastern countries will continue to be supplied from the existing premises at 1 High Street, South Norwood, London, S.E.25. Both branches will work in co-operation with Goodyear at Wolverhampton for the supply of conveyor belting, specialized hoses and similar items which are not normally stock items. The telephone number of the new branch is West Drayton 4343.

Terylene V-belts

Terylene reinforced premium V-belts are being used increasingly, in widely varying conditions—from ½hp machines up to 600hp compressors. In most cases they have lasted twice, and, in some cases, five times as long as standard belts. Additionally, it has often been possible to use fewer individual belts on existing drives, while future drives, designed to incorporate fewer belts, may mean considerable savings in space and money. A booklet will be available from mid-January from I.C.I. Ltd., Hookstone Road, Harrogate, Yorkshire.

Mr Ralph E. Huffam has been appointed vice-chairman of A. Boake Roberts and Co. (Holding) and also a director of A. Boake Roberts and Co., its main subsidiary.

Butakon in Rigid Mouldings

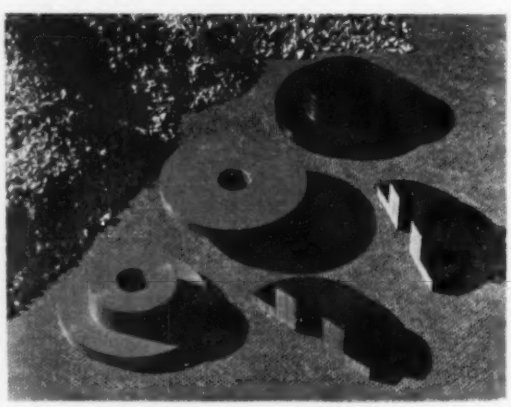
COMPOSITIONS similar to hard rubber can, as is well known, be made using high-styrene resins. Compared with traditional hard rubbers these compositions are claimed to have the advantages of shorter cure time, brighter colours, less odour and superior surface finish. In the past the high cost of such compositions has tended to prevent their wide use. Recipes put forward by I.C.I., however, have shown that the cost can be considerably reduced by judicious use of fillers.

A further interesting feature of these compositions is that they can be produced in the form of granules by cutting the milled sheet in a rotary cutting machine such as a 'Masson' cutter. The granules can then be loaded into moulds to produce sound mouldings.

	Recipe TGL 1391 *Parts by weight*	Recipe TGL 1392 *Parts by weight*
Cure: 10 min. at 153°C.		
'Butakon' S8551 ..	45	—
'Butakon' S7001 ..	—	100
'Intol' 1502 SBR ..	55	25
Whiting	100	200
'Speswhite'	100	—
'Fortafil' A70	—	30
Zinc Oxide	5	5
Stearic Acid	2	2
'Vulcafor' TMT ..	1.5	1.5
'Vulcafor' Fast Scarlet GS	1	—
'Vulcafor' Fast Blue 3RS	—	2
Titanium Dioxide ..	15	2
Sulphur*	15	15

**Magnesium-carbonate-treated sulphur.*

'Butakon,' 'Fortafil' and 'Vulcafor' are registered trade marks of Imperial Chemical Industries Ltd. 'Intol' is a registered trade mark of International Synthetic Rubber Co. 'Masson' is a registered trade mark of Blackfriars Rotary Cutters Ltd. 'Speswhite' is a registered trade mark of English China Clays Sales Co. Ltd.



'Butakon' S moulding powders and mouldings

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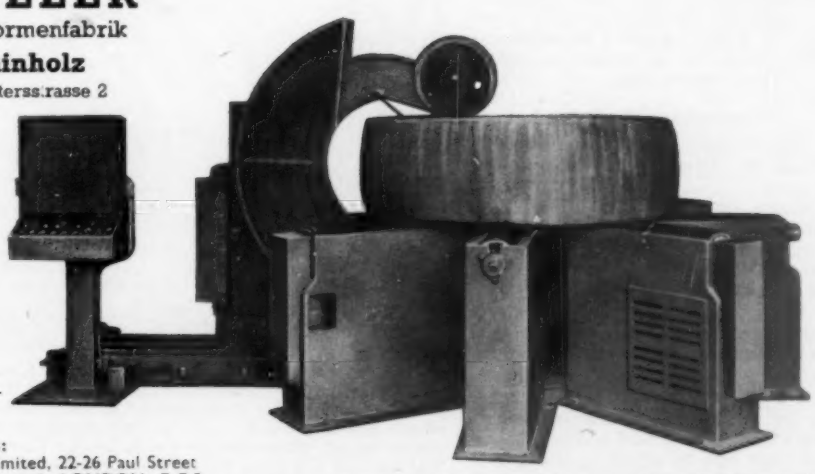

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PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Vulcanization of Latex

No. 819,669. Hercules Powder Co. Application and Filed, September 18 1956. Application in USA, October 5, 10, 31, November 2 1955, July 27 1956. Published, September 9 1959.

Natural and synthetic rubber latices are vulcanized by incorporating in the latex 0.1 to 10% by weight, based on the latex solids, of an organic peroxide compound as specified below and then heating to a temperature of 200° to 375°F. to effect vulcanization of the rubber particles *in situ*. The organic peroxide compound has one of the following general formulae: (a) $R_1(R_2)(R_3)C.O.O.C(R_4)(R_5)R_6$, (b) $CH_2.CH(O.O.R_7)O.R_8$, (c) $R_9(R_{10})(R_{11})C.O.O.R_{12}$, (d) $R_{13}.O.H$. R_1 is aryl; R_2, R_3, R_4 and R_5 are hydrogen or alkyl groups of less than 4 carbon atoms; R_6 is aryl, hydrogen or an alkyl group of less than 4 carbon atoms; R_7 and R_8 are saturated or aromatically unsaturated hydrocarbon radicals; R_9 is the carenyl, p-menthyl or pinanyl radical; and R_{13} is an organic radical linked to the adjacent oxygen through a tertiary carbon atom. The use of these peroxides for vulcanizing solid rubber is claimed in specifications Nos. 754,514, 781,040 and 787,221.

Numerous examples are given of peroxides of the above general formulae. Examples are also given of the preparation of vulcanized natural rubber latex, SBR latex and nitrile rubber latex by means of organic peroxides covered by the invention, together with results of tensile tests on films prepared from the vulcanized latices. The process can be applied to latices of rubbery polymers of conjugated diolefins and chloroprene, but is preferably applied to natural rubber latex.

Derivatives of Rubber

Nos. 820,261-2. The British Rubber Producers' Research Association. Inventors: J. I. Cunneen, W. P. Fletcher, A. N. Gent and R. I. Wood. Application, August 27 1954. Filed, August 25 1955. Published, September 16 1959. No. 820,262 divided out of No. 820,261.

Derivatives of natural and synthetic rubber and gutta percha having greater resistance to crystallization at low temperatures and improved physical properties are made by incorporating in the rubber a chemical compound containing a thiol acid group. A catalyst may also be added to the rubber and the treated rubber may be heated or exposed to ultra-violet irradiation. The combined thiol acid in the rubber is less than 5%. The treated rubber is subsequently vulcanized with the usual vulcanizing agents. No. 820,261 relates to the addition of the thiol acid compound to dry rubber and rubber solutions and No. 820,262 relates to the addition of the thiol acid compound to latex.

Examples of thiol acid compounds which may be used include thiolnaphthoic acid, thiolbenzoic acid, thiolstearic acid, and mono-, di- and trichlorthiolacetic acids. According to examples, vulcanizates made from natural rubber which had been treated with thiol acid compounds had rates of crystallization from 5 times to more than 1,000 times slower than a control sample when elongated by 150% and stored at —26°C. In general, the treated rubbers, when vulcanized, possess improved tear resistance and lower gas permeability in addition to enhanced resistance to crystallization.

Chlorinated Synthetic Polymers

No. 819,702. Phillips Petroleum Co. Application and Filed, May 1 1957. Application in USA, May 17 1956. Published, September 9 1959.

The procedure used for chlorinating natural rubber cannot be applied to synthetic rubbery polymers as the chlorinated product obtained is unsatisfactory, being insoluble in organic solvents. According to the invention, satisfactory chlorinated polymers are prepared by chlorinating a solution containing both a rubbery polymer and a liquid polymer. The preferred blend of polymers is a mixture of a liquid polymer prepared by mass polymerization and a rubbery polymer prepared by emulsion polymerization. The liquid and rubbery polymers which are applicable are homopolymers of aliphatic conjugated dienes and copolymers of such dienes with other compounds containing a vinyl group. The examples relate to the chlorination of blends of liquid polybutadiene with (a) polybutadiene rubber and (b) SBR.

Canadian Asbestos

Shipments of asbestos from Canadian mines in November increased to 124,839 tons from 107,072 in the same month of 1958 and in January-November period rose 13.5% to 978,655 tons from 862,450 in the like 1958 period. Shipments from Quebec mines advanced in the month to 120,420 tons from 102,947 and in the eleven months to 924,605 tons from 815,263.

The telephone number of Croxton and Garry Ltd., 16-18, High Street, Kingston-on-Thames, has been changed to KINgston 9444.

Recently the National Coal Board installed a quantity of a new proofed 'Terylene' ventilation ducting at Parsonage Colliery, Leigh, one of the deepest mines in the country. The Coal Board has now placed a bulk order for over 30 miles of this ducting, which varies in diameter from 12 in. to 24 in., and is about three times lighter than that formerly used. The ducting is made up by Robert Watson and Co. Ltd., Fife, from a specially woven 2¼-oz. per sq. yd. twistless 'Terylene' base fabric produced by C. A. Newsholme and Co. Ltd., Keighley, Yorks. This is one section of the installation at Leigh

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

WELL, no one can say that the stock market has not made an interesting start to the new era of the 1960s.

Business on the whole has remained very active. For a change, however, we can report that it has been more of the two-way variety.

On the first Monday of the New Year the boom in equities gathered fresh momentum.

Buyers backing their fancies for the forthcoming 12 months pushed the industrial share index up to 342.9, another all-time record.

Every one was, of course, asking 'How long can this go on for?' As it turned out they did not have long to wait for an answer. In two short sharp sessions the profit takers had moved in to such effect that the index dropped 11.3 points to 331.6.

What caused this sudden turn round? One of the primary reasons was fear of higher interest rates.

But this, we feel, could have been only an excuse. Those operators who thought that the advance of prices had been too rapid were more likely taking a breather, and during this brief pause many folk obviously took the opportunity of converting their paper profits into cash.

Of course, this kind of technical correction is only to be expected. One of the lessons it serves is to make it quite clear that even the best cannot always keep going up non-stop.

A shake-out can often work wonders. The stock exchange has certainly been making a steady recovery over the past few days.

We consider that at the moment there is still a lot more money to be invested.

These temporary setbacks are the kind of opportunities the big institutions wait for.

There are already signs that some of these important sources are back 'on feed' again.

A glance at our price table below reveals that it is the shares that have risen the steepest over the past few months that took the hardest knocks.

IMPERIAL CHEMICAL INDUSTRIES, one of the bluest of the 'blue-chip' set, has been up to a new peak of 62s. 6d.

Profit taking has since trimmed the shares back to 60s. 3d. COURTAULDS, another pacemaker, has touched 67s. 9d. and is now back to 64s. 4½d.

TURNER AND NEWALL, another big star, went up to 112s. 6d. Now they are changing hands at 105s. 6d. These three still have a bright future.

Some of the plastic favourites have continued to make fresh headway.

BAKELITE, BRITISH XYLONITE, DE LA RUE and MONSANTO are all higher on balance, while BRITISH INDUSTRIAL PLASTICS, in front of their dividend announcement, have been marked up to 11s. 3d.

Another star spot has been the £1 shares of the giant ASSOCIATED ELEC-

Continued on page 104

Share Price Movements

Par Value	Company	1959-60 High	Low	Jan. 2	Latest
£1	A.E. Ind. Ord.	67/-	54/-	59/6	65/-
5/-	Albright & W. Ord.	30/6	13/4½	30/-	28/3
£1	„ „ „ 5% Pref.	18/6	15/4½	18/6	17/-
5/-	Anchor Chemical Ord.	27/3	10/3	25/9	25/-
5/-	Andersons Rub. Ord.	4/3½	3/-	3/1½	3/1½
£1	Angus Geo. Ord.	37/6	21/-	36/6	36/-
5/-	Ault & Wiborg Ord.	23/6	11/9	23/-	22/6
£1	Avon India Rubber Ord.	46/3	27/-	46/-	42/6
£1	„ „ „ 6% Pref.	18/6	17/3	17/9	18/3
10/-	Bakelite Ord.	41/3	17/-	39/6	40/6
£1	„ 6% Pref.	19/6	18/3	18/3	18/-
£1	Baker Perkins Ord.	53/9	30/7½	53/-	52/6
4/-	Bank Bdg. Rubber Ord.	3/4½	1/6	3/-	3/4½
5/-	Boake (A) Roberts Ord.	25/6	9/-	22/-	22/-
£1	„ „ „ 5% Pref.	15/1½	13/9	15/-	15/-
4/-	Brammer H. Ord.	17/6	9/6	16/6	16/3
10/-	Bridge, David Ord.	57/6	16/3	57/-	57/-
5/-	Bright, John Ord.	18/3	8/9	17/9	17/-
2/-	Brit. Ind. Plas. Ord.	11/9	4/9	10/6	11/3
2/-	„ 10% (tax free) Pref.	5/9	4/9	4/3	4/3
£1	British Xylonite Ord.	86/-	28/6	84/-	85/-
£1	„ „ 5% Pref.	16/9	14/-	16/9	16/9
£1	BICC Ord.	61/-	46/3	58/-	59/-
5/-	BTR Ind. Ord.	13/3	8/1½	10/6	10/6
£1	„ „ 7½% Pref.	24/3	20/9	23/9	23/9
£1	Courtaulds Ord.	67/9	20/-	66/6	64/4½
£1	„ 5% 1st Pref.	18/9	15/7½	17/9*	17/6
£1	„ 6% 2nd Pref.	21/9	17/1½	21/-	20/9
4/-	Cow, P. B. Ord.	7/6	3/6	6/10½	7/3
£1	„ „ 5% Pref.	15/-	10/9	15/-	15/-
1/-	Dannimac Mfg. Ord.	11/6	2/6	10/3*	11/3
10/-	De La Rue Ord.	73/6	42/9	70/-	73/-
£1	„ „ „ 3½% Pref.	12/6	10/-	12/6	12/3
10/-	Distillers Co. Ord.	39/6	15/9	38/-	38/-
£1	„ „ 6% Pref.	22/3	19/10½	22/-	22/-
£100	„ 5% Conv. Loan	£96½	£91	£94½	£94½
£100	„ 5½% Unsec. Loan	£97	£87 7/16	£96½	£96½
10/-	Dunlop Rubber Ord.	29/-	14/9	27/6	27/1½
£1	„ „ 5½% Pref.	19/4½	15/10	19/-	18/6
£100	„ 3½% 1st Debs.	£77½	£67¾	£77½*	£77½
£100	„ 4½% 2nd Debs.	£88	£78	£86	£86
£1	Eng. Elect. Ord.	61/-	38/-	50/-	49/9
4/-	Ebonite Cont. Ord.	15/3	7/6	14/-	13/10½
£1	English China Clays Ord.	84/9	29/9	80/6	84/9
£1	Goodyear Tyre 4% Pref.	12/9	12/-	12/6	12/6
5/-	Greeff Chem. Ord.	31/9	14/-	31/-	31/3
10/-	Greeff Chem. 5½% Pref.	8/6	7/9	8/3	8/6
5/-	Hackbridge Hldg.	19/9	14/6	16/3	17/3
4/-	Greengate & Irwell Ord.	7/0½	4/1½	5/3	6/-
£1	Harrisons & Crosfield Dd.	83/3	43/9	56/3†	56/9
1/-	Hunt & Moscrop Ord.	2/6	1/1½	2/-	2/6
£1	Imp. Chem. Ord.	62/6	28/3	60/6	60/3
£1	„ „ 5% Pref.	18/10½	16/-	17/6*	17/6
£100	„ 4½% Unsec. Loan	£90	£80	£88	£88
£100	„ 5½% Conv. Loan	£188	£99	£184½	£185
1/-	Kleemann (O. & M.) Ord.	9/6	2/6	9/-	8/6
£1	„ „ 6½% Pref.	18/6	15/-	18/4½*	18/-
2/-	Lacrinoid Prod. Ord.	4/3	1/5½	4/3	4/6
5/-	Laporte Ind. Ord.	31/-	13/7½	30/-	29/3
£1	„ „ 7½% Pref.	24/3	21/10½	23/9	23/3
£1	Leyland & Birm. Rubber Ord.	58/9	39/9	55/-	54/6
£1	„ „ „ 6% Pref.	21/3	16/1½	18/-	18/-
2/-	London Rubber	14/3	6/3	14/3	14/-
£1	„ 6% Red. Cum. Pref.	19/9	16/3	18/9*	18/9
£1	McKechnie Bros. Ord.	66/3	23/6	61/3	63/9
£1	„ „ 'A' Ord.	67/6	30/-	62/6	66/3
£1	„ „ 6% Cum. Pref.	17/-	16/-	17/-	17/-
5/-	Monsanto Chem. Ord.	27/9	13/-	25/3	27/-
£1	„ „ 3½% Pref.	13/6	11/-	13/-	13/-
£100	„ „ 6% Debs.	£104	£101½	£104*	£104
£1	North British Rubber	20/6	15/7½	19/3	20/6
5/-	Redfern Holdings Ord.	5/9	2/10½	5/6	5/-
2/-	RFD Ltd. Ord.	6/6	3/5½	5/-	6/3
£1	„ „ 5½% Pref.	16/3	11/6	15/6	16/3
2/-	Rubber Imp. Ord.	15/6	4/4½	6/-	6/6
2/-	„ „ 'A' Ord.	14/3	3/9	4/9	5/3
£1	„ „ 5% 1st Pref.	13/3	10/-	13/3	13/3
5/-	Rubber Reg. Ord.	18/3	10/6	17/9	18/-
4/-	Shaw Francis Ord.	25/-	9/9	23/-	24/6
2/-	Silentbloc Ord.	13/-	7/6	10/6	12/6
2/-	Sussex Rubber Ord.	1/11½	7½	1/7½	1/7½
5/-	Sutcliffe Speak Ord.	12/9	5/-	11/6	12/3
£1	Turner & Newall Ord.	112/6	52/-	109/3	105/6
£1	„ „ „ 7% Pref.	25/6	22/1½	25/-	24/9
5/-	Universal Asbestos Ord.	33/9	8/0½	31/6	33/3
5/-	Viscose Dev. Ord.	13/9	6/3	13/9	13/9
5/-	Warne William (Holdgs.) Ord.	17/6	8/-	17/4½	17/3

*Ex-dividend †Ex-capitalization

Rubber Markets

LONDON

Quiet conditions have prevailed in the London rubber market during the past week. There has been little to influence the market either way and the tendency has been towards slightly lower levels. The Spot is virtually unchanged at 34⅞d. per lb. but forward positions are around a halfpenny per lb. lower.

Latest prices are as follows:

No. 1 RSS Spot: 34¾d.-35s.

Settlement House:

February 33¼d.-33½d.

March 32¾d.-33d.

April/June 32¼d.-32½d.

July/September 31⅝d.-31⅞d.

October/December 30⅞d.-31⅛d.

No. 1 RSS cif basis ports:

January 33⅝d.-33⅞d.

February 33¼d.-33½d.

Godown:

January 113¾ Straits cents nominal.

LATEX

Centrifuged latex per gallon in drums, January, February, March 20s. 1d., cif European ports. Spot, 20s. 6d. Bulk, d.w., 19s. 9d. Creamed, seller, January, February, March 19s. 7d. Normal seller, January, February, March, 15s. 5d.

AMSTERDAM

The Amsterdam rubber market ruled as under on January 11:

	Guilders per kilo	
No. 1 RMA	Jan. 11	Previous
January	3.23	3.23
February	3.23	3.23
March	3.23	3.23
January/March ..	3.23	3.23
April	3.13½	3.13½
May	3.13½	3.13½

Sales: Nil Tendency: Quiet

DJAKARTA

About 20 tons of sheet No. 2 were transacted at 55.00 rupiahs per kilo on January 11. The market closed quiet.

	Rupiahs per kilo	
	Jan. 11	Previous
Spot No. 1 Priok ..	55.00b	55.50b
Spot No. 2 Priok ..	54.00b	54.00b
Spot No. 3 Priok ..	53.00b	53.00b
No. 1 fine pale crepe, spot..	48.00b	47.00b

Tendency: Quiet

SINGAPORE

The market opened lower on January 11 in sympathy with the overseas advices and some nervous liquidation. At the lower level short-covering and demand for January shipment reversed the trend and as prices improved sellers withdrew. Factories were buyers of off-grades. In the afternoon, price changes were erratic in slow trading. The turnover was restricted. Lowers were in small demand. Factories were quiet. The market finished the day on a quiet note.

	Straits cents per lb., fob Malayan ports to open ports	
	Jan. 11	Previous Close
No. 1 RSS, Jan. ..	113⅝–114	114⅛–114¾
Feb..	113⅜–114	114⅛–114½
No. 2 RSS, Jan. ..	113½–114	114¼–114¾
No. 3 RSS, Jan. ..	113¼–113¾	113⅞–114¼
No. 4 RSS, Jan. ..	112¾–113½	113⅜–114¼
No. 5 RSS, Jan. ..	111½–112½	111⅞–113¼
No. 1 RSS, Spot..	114 –114½	114⅛–115¼
No. 3 blanket, thick remilled, Jan. ..	112½–114¼	113 –115
No. 1 fine pale crepe, Jan. ..	130⅜–132⅜	131½–133½
2x thin brown crepe, Jan. ..	111¼–112¼	112 –113

Tone: Quiet

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums fob at 203.00d. per gallon.

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on January 11 was 130 Ceylon cents per lb.

NEW YORK

The following landed prices ruled in New York on January 11:

DEALERS' PRICES

	US cents per lb., ex-dock	
	Jan. 11	Previous
No. 1 RSS, Jan. ..	41a	41¼a
Feb. ..	40⅝a	40⅞a
No. 2 RSS, Jan. ..	40⅞a	41a
Feb. ..	40a	40⅛a
No. 3 RSS, Jan. ..	40⅞a	40⅛a
Feb. ..	39⅞a	40a
No. 1 RSS, Spot ..	41a	41⅛n
No. 3 amber blanket crepe, March ..	39⅛n	39⅜n
No. 1 latex thin crepe, Jan..	44⅛n	44¼n
No. 1 latex, thick crepe, Jan... ..	44⅜n	44⅜n

FUTURES—REX CONTRACT

	US cents per lb.	
	Close	Prev. Close
Jan. ..	41.35t	41.25t
March ..	39.70t	39.85–39.80t
May ..	38.70t	38.70t
July ..	37.60t	37.75b–37.90a
Sept. ..	36.80b–37.00a	37.10b–37.30a
Nov. ..	36.40b–36.65a	36.45n
Jan. ..	36.00b–36.25a	36.10n

Sales: 16 Tendency: Steady

Rubber futures were steady on January 11 in slow featureless dealings. Steadiness abroad aided the market here. Traders said that interest in physicals was negligible.

The earlier slight gain in futures was pared or outwiped on light selling towards the close.

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on January 11 was 36.25 (36.50) US cents per lb.

STOCK MARKET

Continued from page 103

TRICAL INDUSTRIES group. The price has improved from 59s. 6d. to 65s.

They have been helped by the signs that 'heavy' industry is at last picking up again.

Some of the other electrical and cable makers like HACKBRIDGE HOLDINGS and BICC have come in for some good support too.

On the company news side we had the results from AVON INDIA RUBBER.

Profits came out at £292,400 against £299,700, and the dividend is to be the same again 11%.

Mr C. M. Floyd, the chairman, says in his report to shareholders that since the end of the financial year there has been every indication that the market for the groups' products will continue to expand.

He warned, however, that so long as the present relationship between natural rubber costs and the selling prices of the company's products persists, satisfactory profits will be very hard to achieve.

In view of the expansion in the motor industry, the chairman says that better results might have been expected but the rising price of natural rubber has been an adverse factor.

Every effort is being made to extend the use of synthetic rubber where possible, but its use is limited in tyres.

The company is also trying hard to expand the general rubber goods side of the business and a new production building was brought into use recently.

Firestone SR Prices

Henry Gardner and Co. Ltd. have informed us of the following price changes for synthetic FR-S (Firestone): (*fas US ports, US cents per lb*).

Hot Rubber Types: FR-S 1000, 1001, 1004, 1006, 1007, 24.10. Cold Rubber Types: FR-S 1500, 1502, 146, 24.10. Oil Modified Types: FR-S 1703, 20.00; 1710, 18.85; 1712, 18.85; 173, 20.00; 178, 19.10; 184, 18.85. Speciality Types: FR-S 1009, 24.75; 1010, 26.00; 1012, 24.25; 1013, 25.00; 1014, 28.10; 158, 30.00; 181, 24.10; 182, 25.00; 158-S, 29.50.

Nigerian Rubber Exports

Nigerian rubber exports in September totalled 2,383 tons compared with 2,183 tons in August. The main destinations were (in tons): UK 1,000, West Germany 709, US 92, Czechoslovakia 135. Exports for the January-September period amounted to 23,256.

Industry INTELLIGENCE

Technical Data

Gentro-Jet Black Masterbatches

Gentro-Jet black masterbatches are prepared by incorporating carbon black in SBR latices by the Columbian process, a unique feature of the process being that no dispersing agent is used to achieve the outstanding standard of dispersion of the carbon black in the rubber. Reports confirm that up to 20% more tread wear is possible by the use of these masterbatches. Eight gentro-jet masterbatches are made in the USA by the General Tire and Rubber Co. and six of these are available in the UK from Columbian International (Great Britain) Ltd., 116 Cannon Street, London, E.C.4.

The composition (in parts by weight) of the six masterbatches available in the UK is as follows: Gentro-Jet No. 9152—SBR 1,500 (rosin acid) 100, SAF black 40, HA processing oil 5, staining stabilizer 1.25. No. 9153—SBR 1,500 (rosin acid) 100, HAF black 52, HA processing oil 10, staining stabilizer 1.25. No. 9154—SBR 1,500 (rosin acid) 100, ISAF black 52, HA processing oil 12.5, staining stabilizer 1.5. No. 9250—Oil-extended SBR 1,712 (mixed acid) 137.5, ISAF black 70, HA processing oil 7.5, staining stabilizer 1.5. No. 9251—Oil-extended SBR 1,712 (mixed acid) 137.5, ISAF black 60, staining stabilizer 1.5. No. 9275—Oil-extended SBR 1,712 (mixed acid) 137.5, HAF black 75, HA processing oil 7.5, staining stabilizer 1.25. Technical information sheets available from Columbian International give values for the volatile matter, ash, organic acid and soap in these masterbatches, together with data for the tensile strength, elongation at break and modulus of the vulcanized material. In the case of Gentro-Jet Nos. 9152, 9153 and 9275, details of the mixing procedure and figures for hardness, tear strength and rebound of the vulcanizates are included.

Bearflex 1751

Bearflex 1751 is a secondary plasticizer and extender for PVC and can replace up to 70% of primary ester-type plasticizers. The efficiency factor of Bearflex 1751 is 1.7, compared to 1 for DOP. For example, when 10 parts of DOP are replaced by Bearflex 1751, the equivalent amount of the latter is 17 parts to give a compound with the same flexibility. As Bearflex 1751 is essentially a non-polar hydrocarbon resin, electrical properties of PVC compounds containing it are substantially improved.

Bearflex 1751 is a product of the Golden Bear Oil Co., Los Angeles, California. The sole distributors for the UK are Croxton and Garry Ltd., 16-18 High Street, Kingston-on-Thames, Surrey. Data sheets giving the physical and chemical properties of Bearflex 1751 and showing the effect of substituting this plasticizer for DOP in a PVC compound are available from the UK distributors.

Machines, Materials and Equipment

Phenolic Resin Foams

Advance information Sheet B.36 entitled 'Bakelite Phenolic Resin Foam,' published by Bakelite Ltd., gives details of a low-density cellular material recently developed for use in thermal insulation and as a lightweight core material for building panels. Information is also given on the special machines which have been developed for rapid mixing and dispensing of the foams, and on the mixing of components.

Bakelite Ltd., supply the phenolic resin, foaming agent and hardener, which can be mixed and then poured into a mould for making into large blocks for cutting into slabs: alternatively, the mix can be poured into cavities for foaming *in situ*. The complete mixing and foaming process takes less than 10 minutes and the foams, which are unique in the plastics foam field because they do not support combustion, can be made into densities from 1lb./cu.ft. upwards.

Phenolic resin foams. *Bakelite photo.*

Slide Rule for Bag Measurements

A new device for calculating polythene film and bag measurements—similar to the well-known engineer's slide rule, but much less complicated—has been developed by U.S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N.Y., USA. Designed as a handy tool for packagers and converters alike, it makes possible rapid computation of a variety of useful data. Basic bag and film values such as width, length, total area, weight, and gauge are all clearly presented. By setting, for instance, the length and width measurements of the bag opposite each other on the first line, the second line then registers the number of square centimetres of film required to produce these bags. At the same time, the weight of 1,000 such bags would appear on the third line for any one of many film gauges ranging from 10 to 100 microns.

New Publications

BX Plastics

Among a number of publications that have recently come from BX Plastics Ltd., Higham Station Avenue, London, E.4, are a leaflet on Transpasene (cellulose acetate film), one on the work of the northern office, and a 14 page booklet which lists, in a handy reference form, the range of materials produced by this company.

The Transpasene leaflet outlines the uses of this film for protecting printed paper and board; the other leaflet (called 'Service in the North') details the delivery service in thermoplastic materials from the Manchester branch of BX and Extrudex Ltd.

British Standards

Toughened Polystyrene Moulding

Details relating to BS 3126: 1959, 'Toughened Polystyrene Moulding Materials,' are contained in a BSI publication of that name. The standard relates to material which produces mouldings having greater impact resistance and extensibility than those dealt with in BS 1493 (polystyrene moulding materials). Requirements are specified for three types of toughened polystyrene moulding materials consisting of thermoplastic polymers or copolymers of styrene and suitable additives. They deal with: impact strength, softening point, tensile strength, elongation at break, water absorption, volatile matter and electrical properties. Methods of test are also specified. 'BS 3126' is one of the marks required to appear on containers of material purporting to comply with the standard. BSI's well-known certification mark—the 'Kite'—may also be applied if the manufacturer is licensed to use it.

Cables for Vehicles

This new edition of BS 1862 deals, as before, both with ignition cables and with cables for the lighting, starting and auxiliary wiring of road vehicles. A PVC-insulated ignition cable has been introduced and the stranding of the rubber-insulated ignition cable has been changed. The range of PVC-insulated light-duty cables now includes single-core cables without further covering, and twin and three-core cables insulated and sheathed with PVC compound. Other changes in make-up and finish bring the standard into line with present-day practice. In some sizes alternative conductors are now given to provide for greater or less flexibility.

The test requirements given in this 20-page standard are generally similar to those of the 1952 edition.

Electrically Conducting Rubber Floors

The accumulation of static electricity is a serious hazard in, for example, explosive works and hospital operating theatres. A new British Standard (BS 3187) deals with the use of rubber flooring, in which carbon black is incorporated, for the safe discharge of this electricity to earth.

BS 3187 puts an upper limit on the permitted electrical resistance (50,000 ohms) but no lower limit, and makes the important proviso that where this type of flooring is in use, all wiring and controls must be outside the zone of risk, and portable electric equipment and flexible connexions prohibited. This 10-page standard, prepared under the supervision of the Rubber Industry Standards Committee, deals with all the factors necessary to make such electrically-conducting floors safe and durable and gives standard methods of testing and sampling.

The address of the British Standards Institution Sales Branch is 2 Park Street, London, W.1.

Export Opportunities

Chemicals for Bolivia

Mr A. W. Jansen, the chief buyer for Manufactura Boliviana SA Fabrica de Calzado 'Manaco,' Casilla 513, Cochabamba, Bolivia would like to receive offers from UK suppliers for a number of items, including the following rubber chemicals: Zinc Oxide, Magnesium Oxide, Zinc Carbonate, Stearic Acid, Various rubber accelerators, Neoprene, Rubber colours, Carbon Blacks, Sulphur (rubbermakers), Iron Oxide Red, Iron Oxide Yellow, Dioxide Titanium, Lithopone, Calcium Carbonate, Mineral Rubber, Sunproof Wax, Paraffin Wax, Cumaron Resin, Zinc Stearate. Also on the list are plastics for the shoe industry.

Manufactura Boliviana SA Fabric de Calzado 'Manaco,' who operate a shoe factory belong to the 'Bata' concern. Interested suppliers should write direct to Mr Jansen, sending a copy of their initial correspondence to the Commercial Section, British Embassy, Avenida Arce 2732—2754, PO Box Casilla 694, La Paz, Bolivia. B.O.T. reference: ESB28831/59.

The address of the Export Services Branch of the Board of Trade is Lacon House, Theobalds Road, London, W.C.1. Telephone number: Chancery 4411, extensions 776 or 866.

Catalyst Prices Down

Prices of 'Dabco' (triethylene diamine) urethane foam catalyst manufactured by the Houdry Process Corporation are now as follows (effective January 1 1960, price per lb., delivered): 1 to 4lb., 80s.; 5 to 45lb., 77s.; 50 to 200lb., 69s. 9d.; 250 to 450lb., 65s.; 500lb. or more, 63s. 6d. Standard packing: 1lb. amber glass jar; 5lb. polythene-lined fibre drum; 50lb. aluminium-lined Leverpak fibre drum. Available from Jacobson van den Berg and Co. (UK) Ltd., 3-5 Crutched Friars, London, E.C.3.

(Photo: British Resin Products Ltd.)
These 'Sky-line' strainers marketed by the Prestige group are moulded in British Resin Products' 'Rigidex' high-density polythene and incorporate a nylon mesh. They are available in red, yellow and blue, in three diameters

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

Manchester Section.—Monday January 25 at the Newton Heath Technical College, at 6 p.m. 'Developments in the Preservation and Testing of Latex, by M. W. Philpott, M.Sc., A.R.I.C., F.I.R.I. (BRPRA).

PLASTICS INSTITUTE

London and District Section.—Tuesday January 19 at Wellcome Buildings, Euston Road, London, N.W.1, at 6.30. 'Plastics in the Packaging Industry,' by G. Swift, B.Sc., Ph.D., Metal Box Co. Ltd.

North-Eastern Section.—Wednesday January 20 at Eldon Grill, Grey Street, Newcastle, at 7 p.m. 'Chromatographic Analysis' by M. Rutter.

Western Section. — Wednesday January 20 at the Wheatstone Hall, Gloucester, 7 p.m. 'Plastics in the Automobile Industry,' by A. C. Hill, M.S.A.E., A.M.I.B.E., M.I.B.C.A.M., Pressed Steel Co.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

ACMESET (791,351) For flooring made of rubber, thermo-setting plastics or of cork; flooring materials and tiles, all made of rubber, thermo-setting plastics or of cork; and floors (not wholly or principally of metal) impervious to electrostatic charges. By the Acme Flooring and Paving Co. (1904) Ltd., River Road, Barking, Essex. To be associated with No. 615,576 (3326, 498) and others. (Class 19; November 18 1959.)

ACMETRED (791,352) For flooring made of rubber, thermo-setting plastics or of cork; flooring materials and tiles, all made of rubber, thermo-setting plastics or of cork; and floors (not wholly or principally of metal) impervious to electrostatic charges. By the Acme Flooring and Paving Co. (1904) Ltd., River Road, Barking, Essex. To be associated with No. 615,576 (3326, 498) and others. (Class 19; November 18 1959.)

BEUTEX (792,902) For toys. L. W. G. (Plastics) Ltd., Windmill Road, Sunbury-on-Thames, Middlesex; manufacturers.—3rd July, 1959.

FLEXADRAIN (789,349) For rubber jointing sleeves for drainpipes and conduits. By Nathaniel Howard Buglass, Hanover Court, Hanover Square, London, W.1. (Class 17; November 25 1959.)

PLASTOID (788,488) For adhesive substances for industrial purposes. By Plastic Products Co., 8475 Georgia Avenue, Detroit 11, State of Michigan, USA. Address for service is c/o W. P. Thompson and Co., 12 Church Street, Liverpool, 1. (Class 1; September 2 1959.)

PRICE'S (769,106) For fatty acids and fatty alcohols, all for use in industry. By Price's (Bromborough) Ltd., Bromborough Pool, near Birkenhead, Cheshire. (Class 1; August 26 1959.)

HETRON (785,652) For polyester resins. By Hooker Chemical Corporation, Buffalo Avenue, and 47th Street, Niagara Falls, New York. Address for service is c/o Forrester Ketley and Co., Jessel Chambers, 88/90 Chancery Lane, London, W.C.2. (Class 1; August 26 1959.)

FLUOROX (785,318) For filtering materials made of polytetrofluorethylene. By Aerox Ltd., Lister Place, 423 Hillington Road,

Hillington, Glasgow, S.W.2. (Class 2; September 2 1959.)

CON-SEAL (B785,420) For coating preparations (in the nature of paint) made of plastics for use in sealing floor surfaces. By Stewart Wales, Somerville Ltd., Calderbank House, 99 Brownside Road, Cambuslang, Lanarkshire. (Class 2; August 26 1959.)

NYLAFILM (780,762) For printing plates made of nylon plastics. By A. H. Lakeman (Printing Machinery and Appliances) Ltd., Eyot Works, Eyot Gardens, Hammersmith, London, W.6. To be associated with No. 785, 791 (4227, 752). (Class 7; September 2 1959.)

BETTI (772,794) For rubber, artificial rubber, and sleeves made principally of rubber for use on pipes used in drilling operations. By the Bettis Rubber Co., 641 Putnam Drive, Whittier, California, US. Address for service is c/o Stevens, Langner, Parry and Rollinson, 5 to 9 Quality Court, Chancery Lane, London, W.C.2. (Class 17; September 2 1959.)

SATINEX (B784,732) For floor tiles made of plastics. By George Kendrick Findlay, 5-15 Cromer Street, London, W.C.1. (Class 19; September 2 1959.)

PATENT LIST

Printed copies of the Specifications in the following list, published by permission of the Controller of H.M. Stationery Office, can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on December 31 1959

E. I. Du Pont De Nemours and Co. Synthetic polyesters and products formed therefrom. 826,248.

Dow Chemical Co. Coating method for polythene and composite articles thereby obtained. 826,269.

E. I. Du Pont De Nemours and Co. Photopolymerizable compositions and their uses. 826,272.

E. I. Du Pont De Nemours and Co. Interpolymerization of hydrocarbons. 826,178.

Esso Research and Engineering Co. Polymerization catalysts for olefins. 826,184.

Owens-Corning Fiberglas Corp. Process for producing porous sheet material. 826,205.

Resistoflex Corp. Hose end fitting of the detachable re-usable type. 826,220.

General Electric Co. Cross-linking agents for uncured rubbers. 826,312.

NEW COMPANIES

Metafil Manufacturing Co. Ltd. (640,065).—October 20. Capital: £1,000 in £1 shares. To carry on the business of manufacturers and suppliers of plastic metal, chemical manufacturers, manufacturing chemists, electrical, mechanical, radio and general engineers; to acquire the trade mark 'Metafil' and goodwill in connection therewith, etc. The first directors are: John Compton, The Gables, Sylvan Hill, Norwood, S.E.19 and Norman F. Austen, 42 Jasper Road, Norwood, S.E.19. Regd. office: 122a Anerley Road, Anerley, S.E.20.

Sefton Plastic Products Ltd. (640,228).—October 22. Capital: £100 in £1 shares. To carry on the business of manufacturers, moulders, extruders and fabricators of glass fibre/polyester laminates and all kinds of plastic materials, kitchen and domestic utensils, etc. The directors are: Jacob Morris, Rachel B. Morris and Elliott Morris all of 35 Queens Drive, Liverpool, 18. Regd. office: 87 Lord Street, Liverpool, 2.

Merseyside (Foam Products) Ltd. (640,165).—October 22. Capital: £500 in £1 shares. To acquire the business of importers, merchants, factors and manufacturers of rubber or synthetic plastic foam carried on by Anne Saiet at Liverpool as 'Merseyside Foam Cushion Manufacturers,' etc. The directors are: Sidney Saiet, 122 Queens Drive Liverpool, 18; Bernard Saiet, 10 Braydon Close, Hunts Cross, Liverpool 24; Directors of Falkner Roller Co. Ltd. Regd. office: 46/8, South Castle Street, Liverpool.

C. C. Roworth Son and Co. Ltd. (640,148). October 22. Capital: £25,000 in £1 shares (24,000 'A' and 1,000 'B' shares). To carry on the business of dealers in footwear leather and rubber goods, etc. The subscribers (each with one 'B' share) are: Emanuel Westbrook and Marcus Sefton-Green, both solicitors of 14/18 High Holborn, W.C.1. Christopher C. Roworth is permanent director. Solicitors: Osmond Bard and Westbrook, 14/18 High Holborn, W.C.1.

Qualcom Ltd. (644,218).—December 10. Capital £100 in £1 shares. To carry on the business of manufacturers and merchants of plastic metal moulded electronic and general engineering components, manufacturers of and dealers in moulding powders, pastes or suspensions of plastic powders, etc. The directors are: Alexander Briggs and Mrs. Rita Briggs, both of 68 Manor Road North, Hinchley Wood, Esher, Surrey. Regd. office: 68 Manor Road North, Esher.

Anglo-Orient Manufacturing Co. Ltd. (641,400).—November 6. Capital: £10,000 in £1 shares. To carry on the business of manufacturers, converters, exporters and importers of and dealers in textiles, yarns, plastics, metals, chemicals, etc. The directors are: Elias Kedoori Ellis (known as Elias Khedoori), 50 Whitworth Street, Manchester, 1; William Morrison, 40 Brazennose Street, Manchester. Elias Kedoori Ellis is the first director. Regd. office: 50 Whitworth Street, Manchester, 1.

Latest Wills

Mr Geoffrey William Ison Sheavyn, of 9 Bracebridge Road, Four Oaks, Sutton Coldfield, Warwickshire, head of the inventions and patents departments at the Dunlop Rubber Company, who died on June 7 1959, left £27,683 gross, £26,614 net value. (Duty paid £3,911.)

Mr Alfred Coote Mulloy, of Staick House, Eardisland, Herefordshire, retired rubber estate manager, who died in Cape Town, S. Africa, on July 21 1959, left estate in Great Britain valued at £5,180 gross, £5,130 net value. (Duty paid £172.)

Mr Alexander Harman Orr, of 30 Belgrave Road, Monkstown, Co. Dublin, formerly of Perak, Malay Straits, retired planter, who died on September 19 1959, left estate in England and the Republic of Ireland valued at £5,238 (£3,791 being gross personal estate in the Republic of Ireland. Duty paid £293).

COUNTY COURT JUDGMENTS

NOTE.—*These Judgments which are supplied from the Registry of County Court Judgments, Lord Chancellor's Department, 3 Dean's Yard, London, S.W.1, are not necessarily for debt, and some may have since been satisfied. They may be for damages or otherwise, they may relate to actions bona fide contested between the parties, or they may be against defendants liable in a representative capacity and not personally; but no distinction is made on the register. A judgment does not imply inability to pay. Judgments are not returned to the Registry if satisfied in Court Books within twenty-one days.*

THE NORTHERN ASBESTOS CO. LTD. with whom is incorporated NORTHERN DECORATING CO., Dawes Lane, Scunthorpe, Lincs. Bradford, £12 8s. 9d., September 22 1959.

DOTSON, HARRY JOHN, 82 Olaf Street Dwellings, Latimer Road, London, W.11, car and tyre dealer. West London, £17 5s. 6d., October 1 1959.

MAGUIRE, JOSEPH, 15 Nora Street, Warrington, Lancs., tyre dealer. Warrington, £61 12s., October 2 1959.

ALPHA PLASTICS AND ENGINEERING CO., LTD., R/O 61 Southwood Drive, Tolworth, Surrey. Kingston-upon-Thames, £30 5s. 3d., October 1 1959.

DEFIANCE RUBBER CO. LTD., 12 Coleman Street, London, E.C.2. Shoreditch, £40 5s., October 12 1959.

ARTHUR FRAYLING WRIGHT (PLASPEX PRODUCTS), 4 Monument Place, Liverpool. Liverpool, £32 2s., October 2 1959.

S.P. STRUCTURAL PLASTICS, Ltd., The Old School House, Eythorne, Kent, plastics goods manufacturers. Shoreditch, £24 3s. 6d., September 8 1959.

NORTHERN ASBESTOS CO. LTD., Dawes Lane, Scunthorpe, Lincs. Liverpool, £23 13s., July 22 1959.

CHARLES JAMES TAYLOR, 5 Ellerby Walk, Leeds, 9, Yorks., tyre merchant. Leeds, £27 19s. 4d., September 29 1959.

LIGHTWEIGHT PLASTICS LTD., Factory No. 2, Goodwin Road, N.8., Middx. Mayor's and City, £29 12s., October 23 1959.

THOMAS FRANCIS WOODS, Carmel Mount, Gerrads Lane, St. Helens, Lancs., tyre dealer. St. Helens and Widnes, £60, September 17 1959.

THE ROCKS PLASTIC FOAM CO., LTD., 1 Hammerwood Road, Ashurst Wood, near East Grinstead, Sussex. Westminster, £86 10s., October 26 1959.

DENBAR PLASTICS, 457 Mawney Road, Romford, Essex. Stroud, £21 9s., October 6 1959.

New sewing machine cases have been made from Union Carbide's high-impact polystyrene. They are 4 lb. lighter than wooden cases previously used and, with a high-gloss finish, look much more attractive

Rubber Journal and International Plastics CLASSIFIED ADVERTISEMENTS

APPOINTMENTS VACANT

6d. a word, Minimum 10/- Box 2/-

ADHESIVE technologist with experience of thermoplastic synthetic resin adhesives required for technical service department of leading resin manufacturers in the London area. Progressive appointment in expanding section. Pension and life assurance schemes in operation. Please reply, giving details of age, qualifications and experience to RJ/AT.—Box 398. (398)

APPLICATIONS are invited for trainee assistant chemist for rubber manufacturers situated near Manchester specialising in ebonite and mechanical rubbers. Candidates should be aged 20 to 30 with H.N.C. and L.I.R.I. There are very real prospects of advancement both in salary and status for someone with initiative and willing to accept responsibility. The successful applicant would be required to enter into a long term service agreement after an initial proving period. Contributory pension scheme. Write stating age, qualifications, experience and particulars of previous appointments with dates to the Managing Director.—Box 387. (387)

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